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ABSTRACT

The first phase of an ongoing library automation project at Stanford University is described. Project BALLOTS (Bibliographic Automation of Large Library Operations Using a Time-Sharing System) seeks to automate the acquisition and cataloging functions of a large library using an on-line time-sharing computer. The main objectives are to control rising technical processing costs and at the same time to provide improved levels of service. Phase I produced a prototype system that operated in the library using typewriter terminals. Data preparation and data control units were established; regular library staff were trained in on-line input and searching. After a nine month period of operation, the entire system was evaluated. The requirements of a production library automation system were then defined. Findings are presented on shared facilities, economy and file integrity, the performance of on-line searching, terminal performance, staff and resource commitments, transferability, and the human aspects of system development. Recommendations are presented with respect to feasibility, economic factors, management, staffing, documentation, terminal equipment, and national planning. (Author)

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② BIBLIOGRAPHIC AUTOMATION OF LARGE LIBRARY OPERATIONS USING A TIME-SHARING SYSTEM: PHASE I

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ABSTRACT

This report describes the first phase of an ongoing library automation project at Stanford University. Project BALLOTS seeks to automate the acquisition and cataloging functions of a large library using an on-line time-sharing computer. The main objectives are to control rising technical processing costs and at the same time to provide improved levels of service. Phase I produced a prototype system that operated in the library using typewriter terminals. Data preparation and data control units were established; regular library staff were trained in on-line input and searching. After a nine-month period of operation, the entire system was evaluated. The requirements of a production library automation system were then defined.

Findings are presented on shared facilities, economy and file integrity, the performance of on-line searching, terminal performance, staff and resource commitments, transferability, and the human aspects of system development. Recommendations are presented with respect to feasibility, economic factors, management, staffing, documentation, terminal equipment, and national planning.

Suggested ERIC Descriptors

(main terms)
automation
library research
library technical process
information retrieval
university libraries

(other terms)
cataloging
electronic data processing
information processing
library acquisition
library cooperation
library equipment
library networks
man machine systems

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PREFACE

Project BALLOTS is an on-going library automation development effort at Stanford University. Phase I covers the period of prototype system development and operation as well as the first months of production system development. Since its inception, the project has benefited from the advice and assistance of many people. Although only a few of them can be mentioned in this preface, our appreciation goes to all who contributed during a long and complex development process.

Special acknowledgment is extended to the following persons and groups connected with the project:

Paul Armer, former Director of the Stanford Computation Center;

Roderic M. Fredrickson, former head of the Campus Facility (IBM 360/67) of the Stanford Computation Center;

Ralph Hansen, Chief Librarian of the Acquisition Department;

Jennette Hitchcock, Chief Librarian of the Catalog Department;

Prof. William F. Miller, former Vice President for Research (now Provost of the University);

Prof. Edwin B. Parker, Department of Communication;

David C. Weber, Director of University Libraries;

Members of the BALLOTS External Advisory Committee (see section 2.2 for a list of members).

Many other persons in the university community--especially in the Libraries and the Computation Center--contributed thousands of hours.

The achievment of the prototype system is a result of the work done by the entire Project BALLOTS staff, plus that done by members of the Project SPIRES staff in areas of common software development. It is a pleasure to acknowledge the work of William Riddle (now of the University of Michigan Department of Communications), who designed the on-line executive program, and of James Marsheck, who played a major role in designing the search facility. Wayne Davison, Diana Delanoy, and Jerry West made significant contributions in the library systems analysis for the prototype system. Glee Cady and Carol Kayser were largely responsible for the smooth functioning of the Data Preparation and Data Control units in the library. Pam Dempsey of the Catalog Department and Fred Lynden of the Acquistion Department contributed many hours and their detailed knowledge of library operations.

This report has been read and commented on by a special technical subcommittee of the BALLOTS External Advisory Committee, consisting of Fred Bellomy, Manager, University of California Library System Development Program; Grover Burgis, Director, Research and Planning Branch, National Library of Canada; Audrey Grosch, Head, Systems Office, University of Minnesota Library; John P. Kennedy, Data Processing Librarian, Price Gilbert Memorial Library, Georgia Institute of Technology; Fredrick Kilgour, Director, Ohio College Library Center; and David Weisbrod, Head, Development Department, Yale University Library. Particular appreciation is extended to Donald V. Black of System Development Corporation, who chairs this subcommittee. Mr. Black's extensive and constructive comments and the example of his excellent report on a sister project (Project LISTS <4>) contributed immeasurably to the improvement of this report. Neither Mr. Black nor any of the subcommittee is responsible for errors or inadequacies in this report.

We especially acknowledge the capable assistance of Jennifer Hartzell in organizing, editing, and producing this report. The BALLOTS staff has been ably supported in its work by the following secretaries: Marlene Amiot, Sandra Anderson, and Charla Meyer.

The complexity of the BALLOTS Project has been estimated at twenty to fifty times greater than the development effort that Stanford applied to the computer-produced Meyer Undergraduate Library Book Catalog Project--an effort that produced several thick volumes of documentation <13>. This report, therefore, can only hope to cover the highlights of a large and multifaceted development effort. The reader will not find in this document extensive flow charts outlining specific design modules, or program listings. Much of the very detailed design work, particularly that relating to the on-line facilities, has been included in quarterly reports to the Office of Education. The substantive reports have been made available in the ERIC system and are referred to in the text and references. This report covers the period from June 1967 to June 1970.

This Final Report follows the outline format prescribed for U. S. Office of Education research reports. Chapter 1.0 summarizes the recommendations of the report, describes the problem context and background, and states the scope and goals of the system. Chapter 2.0 describes the development and operation of the BALLOTS I prototype system. Chapter 3.0 discusses some findings based on the operation and evaluation of BALLOTS I. Chapter 4.0 discusses the recommendations that can be made at this stage in the development of the BALLOTS system.

1.0 INTRODUCTION

Project BALLOTS (Bibliographic Automation of Large Library Operations using a Time-sharing System) is directed toward maximizing the contribution of the large research library to university education. Increasing costs of operation and the limitations of a manual file system inhibit the library's responsiveness to the changing information requirements of higher education <33>. The BALLOTS approach is to provide technological assistance to the library in the form of an on-line, production, bibliographic processing system <27>. This system must be available on a daily basis, initially to support technical processing operations but with the ability to extend direct service to public users. The project is divided into two major phases: BALLOTS I, research and prototype development, completed at the end of calendar 1969, and BALLOTS II, production system development, the present ongoing activity.

1.1 Summary of Recommendations

To assist the reader in evaluating the conclusions reached in the prototype development phase, a summary of recommendations is presented first. It is important to bear in mind that the project is not yet completed and these recommendations are in the nature of an interim report. Nevertheless, it is our belief that they represent reasonable conclusions based on three years' experience with on-line library system development. Each recommendation is discussed more fully in Chapter 4.0.

1. FEASIBILITY RECOMMENDATION

A library considering on-line system development should conduct feasibility studies that make clear the advantages and disadvantages of in-house development, contracted development, and a mixture of both.

2. ECONOMIC RECOMMENDATION

At the present time, the cost of developing large, on-line library systems must be supported by funding outside the library's operating budget.

3. MANAGEMENT RECOMMENDATION

On-line system development should have professional computer management, under the policy direction of the library and subject to the library's continuing review and approval.

4. STAFFING RECOMMENDATION

Libraries considering on-line systems should secure or contract with technical personnel having on-line experience, preferably in some kind of bibliographic/retrieval application.

5. DOCUMENTATION RECOMMENDATION

Documentation is a primary development task, and funds, specialized personnel, and formal management commitment are needed for its accomplishment.

6. EQUIPMENT RECOMMENDATION

Specifications for video (CRT) terminal equipment to support on-line library operations should be brought to the attention of manufacturers.

7. NATIONAL PLANNING RECOMMENDATION

The development of large, on-line library systems should be planned and implemented on a regional basis.

1.2 The Problem Context

Well-known to librarians but generally hidden from the layman's view is the vast "iceberg" of internal technical processing activities in the library. Large and complex files are subject to intensive operations: record creation, deletion, update, sorting, filing, searching, and selective output. Material comes to the library from every country of the world and in every language; foreign books and documents are printed with special symbols and graphic characters whose requirements range far beyond those of common English or of roman alphabet notation. The Library of Congress's own requirements for graphic characters call for 175 unique character representations for roman alphabet material alone, a number doubtless far beyond the requirements of many other libraries, but one that indicates the scope of the problem of inputting, storing, processing, and outputting bibliographic records.

The number of files in a library may range from a few dozen in small and medium-sized libraries to hundreds in university and research libraries. The Library of Congress is known to employ over 1,200 files in maintaining its worldwide bibliographical services. University and research libraries maintain centralized union catalogs that often contain five to ten million cards or more. Institutions that have many discipline-oriented departmental libraries must also maintain catalogs and shelf lists for each of these unit or branch libraries.

The number of transactions involving library files can be staggering. Those involving certain files in a large library can easily exceed several hundred per hour. A large public library system may record from a quarter-million to a million loan transactions per month. Each loan represents at minimum two transactions in the file, one for charging an item and one for discharging it. To these must be added the innumerable requests for reserving books held by other borrowers, identifying overdue items, recalling items, notifying requesters, and the like.

Large as the circulation transaction volume is in a typical library, circulation files share a singular characteristic: their bibliographic content is relatively small and changes very little. In library technical processing, however, the opposite is the case: bibliographic content is extensive, complex, changing, and often only partially or inaccurately known. How is it possible to conceive of bibliographic information that is known only partially or inaccurately? The vagaries of the international book trade and the complexities of the publishing industry commonly introduce unknowns into the library data base at the initial point of a record's entry into library files. Publishers change the titles of books previously announced in a prospectus. The title of an unchanged or slightly altered reprint is changed without notice to the public. A list of multiple authors is rearranged owing to the death of a contributor or to the resignation of a joint author. Publications of a work in the same language but in different countries are given different titles, and may even vary slightly in content. Through personal correspondence, conferences and meetings, and announcements in journals, faculty members learn of new works in press and initiate book requests based on incomplete information, incorrect spellings, or faulty recollection. Students, faculty, and librarians seek out works from published citations that are ambiguous, incomplete, or erroneous.

Additions to and maintenance of the card catalog rival the activity in the circulation system. During the past five years the Stanford Libraries have added nearly one million cards to the main card catalog. The effective rate of adding new records to all Stanford catalogs approximates 1,000 records per work day. It would be a sufficiently complex problem to deal with these record and file characteristics in the English language. But the large university library typically takes in about 50 percent of its material in foreign languages, and in large metropolitan centers, such as New York and San Francisco, public libraries must acquire and process large amounts of foreign language materials in order to accommodate the needs of special ethnic or linguistic constituencies. Obtaining staff who can read, spell, and understand a multiplicity of languages is essential to proper maintenance of large bibliographic files; but even then the prevalence of transcription and filing errors in manual systems is a significant cause of inefficiency in the large library.

Typically, the staff assigned to file creation, searching, and maintenance are library assistants working under the supervision of librarians. In the academic community, student spouses constitute a ready source of assistants. Unfortunately, the work is routine, and those best qualified to perform it become bored quickly. Furthermore, here as in other areas the economic constraints of university libraries prevent effective wage competition with local business and industry. The result is excessive staff turnover, leaving the librarian with poorly done clerical work, too much revision of clerical work, and wastage of a high percentage of professional time in continually training new staff.

Another problem is vocabulary and terminology. It is not enough for the large library to furnish access to its bibliographic files by author and title; users who do not know the writers in a specific field--especially students who are beginning their academic careers--must be given subject access to the library's collections. Yet subject terminology is being revised continually in the field, especially as a result of the coalescence of many disciplines, such as biophysics, medical electronics, aerospace medicine, and the like. Although not physically impossible, it is economically and managerially impossible to maintain current subject headings in a large manual system that includes all subjects and all major languages, where the collections range in time from the earliest printed materials to present-day works; and where content has no chronological limit.

Evidence of the decreasing effectiveness of manual technical processing may be found in the increasing unit cost of book processing during a period when teaching, research, enrollments, and publications all increased significantly <34>. Where the traditional purchase-cost - labor-cost ratio for book purchase and processing was practically one for one for many years, it now appears we are reaching the point where it regularly costs more to process a book than to buy it. Inflation as it affects salary levels and book prices is a factor in the overall increase but the affect on salaries seems to be greater than on prices. Figure 1, a table of book and technical processing expenditures during a recent six-year period at Stanford, illustrates this. Overmyer <20, p. 272> in a critical review of library automation states:

> Even those who are not very enthusiastic about automation admit that, assuming no more than the present rate of growth, many libraries will not be

Stanford University Libraries

	1963/64	1964/65	1965/66	1966/67
1. Technical Processing Costs				
Resources Development Program	$ 23,089	$ 43,998	$ 54,592	$ 55,841
Acquisition Div. @ 80%*	89,000	101,000	120,000	150,000
Catalog Div @ 100%	119,767	161,081	256,986	325,918
Total	$231,856	$306,079	$431,578	$531,759
Percentage of 68/69 level	27%	35%	50%	62%
2. Book Expenditures (excl. binding & periodicals)	351,000	394,000	487,000	617,278
3. Nos. 1 & 2 totaled	582,856	700,079	918,578	1,149,037
4. Tech. Proc. Costs (No. 1) as a percentage of total costs (No. 3)	40%	43%	47%	46%
5. Tech. Proc. Staff vs. Ref. Staff (ratio of percentages)	43/57	43/57	51/49	53/47
6. Titles Cataloged (Univ. Libraries only)	23,206	24,142	31,469	58,399
7. Unit Proc. Costs (Nos. 1-6)	$10	$12.70	$13.75	$9.10

* 20% of Acquisition Division activity relates to binding and ser periodicals--both excluded from these figures.

** The Library added 22,000 microforms en bloc in 1966/67, which resulted in an apparent lowering of preparation costs for the year's workload.

Figure 1

Stanford University Libraries

	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
Costs						
lop-	$ 23,089	$ 43,998	$ 54,592	$ 55,841	$ 64,680	$ 98,600
	89,000	101,000	120,000	150,000	208,500	256,000
100%	119,767	161,081	256,986	325,918	459,926	503,000
	$231,856	$306,079	$431,578	$531,759	$733,106	$857,600
	27%	35%	50%	62%	85%	100%
ditures ding & s)	351,000	394,000	487,000	617,278	669,590	720,000
	582,856	700,079	918,578	1,149,037	1,402,696	1,577,600
. Costs (No. ercentage of s (No. 3)	40%	43%	47%	46%	52%	55%
. Staff vs. (ratio ages)	43/57	43/57	51/49	53/47	57/43	60/40
aloged raries	23,206	24,142	31,469	58,399	53,689	57,990
Costs	$10	$12.70	$13.75	$9.10**	$13.60	$14.80

isition Division activity relates to binding and service to
--both excluded from these figures.
added 22,000 microforms en bloc in 1966/67,
ted in an apparent lowering of preparation costs
r's workload.

Figure 1

able to handle their day-to-day processing by manual methods and will be forced to look for alternatives.

1.3 Background Review

In 1967, the University Libraries and the Stanford Institute for Communication Research began research projects with funds from the Office of Education (for BALLOTS) and the National Science Foundation (for SPIRES). In 1968, the two projects came under the policy direction of the SPIRES/BALLOTS Executive Committee; the shared perspective and close collaboration of the projects were thus formalized.

Stanford University was an appropriate setting in which to initiate research and development in bibliographic retrieval. A strong interest was taken in automation in all areas of the Stanford University Libraries, especially by the Libraries' Associate Director (now Director), David C. Weber, and the Assistant Director for Bibliographic Operations, Allen B. Veaner. During the period from 1964 to 1966, the library had achieved a remarkably successful computer-produced book catalog for the J. Henry Meyer (Undergraduate) Library. Edwin B. Parker and his colleagues at the Institute for Communication Research were even then applying to computer systems the behaviorial science analysis that they and others had applied already to print, film, and television media. The Stanford Campus Facility had an IBM 360 model 67 computer, a locally developed time-sharing system, and a first-rate programming staff associated with one of the nation's leading computer science departments. A close working relationship between the University Libraries, the Computation Center, and the Institute for Communication Research made a firm foundation for research and development.

In the library, an analysis and design group worked closely with the library staff in studying library processes and defining requirements. The combined project software development group applied themselves to writing programs necessary for bibliographic retrieval. This joint effort created a prototype system that could be used in the Main Library and by Stanford faculty and students, primarily high-energy physicists.

In early 1969, two prototype applications were activated using the jointly developed systems software: an acquisition system (BALLOTS I) was established in the Main Library, and a bibliographic retrieval system (SPIRES I) was established for a group of high-energy physicists.

Centralized management of library input was handled by two newly created units, Data Preparation and Data Control. Several terminals were installed in the Main Library for on-line searching, and a terminal was placed in the Physics Library. An on-line In Process File was created, consisting of 30 percent of the roman-alphabet acquisition material ordered by the library. A specially trained staff performed on-line searching daily during regular library hours. This prototype acquisiton system operated during most of 1969, demonstrating the technical feasibility of the combined project goals. It was studied and evaluated by the library systems and programming staffs, who reviewed the human, economic, and technical requirements of a library bibliographic retrieval system.

At the Stanford Linear Accelerator Center (SLAC) Library, a file of preprints in high-energy physics was created through SPIRES I <24>. This file is still active; records of new preprints are added weekly, and a note is made of any preprint that is published. Input is via an IBM 2741 typewriter terminal in the SLAC Library. Regular library staff at SLAC handle inputs and updating. Searching can be done by author, title, date, and citation. The preprint file contains approximately 9,000 documents, including all the high-energy-physics preprints received in the SLAC Library from March 1968 to the present. "Preprints in Particles and Fields," a weekly published listing of preprints, also is produced from SPIRES I.

1.4 Scope of the Project

A recent survey of library automation lists over 250 projects or existing systems <16>. Some universities with major research libraries have not chosen an on-line approach <12, 21>. In the belief that flexible, comprehensive, and long-range economical computer support for the library can be attained by on-line systems, Stanford has chosen to develop a production system for acquisition and cataloging that is extendable to other library operations (e.g. circulation). A prototype system was the basis for exploring problems of on-line development and operation. The production system must be available daily throughout library working hours for input, update and search of on-line files and output of needed ordering and cataloging documents. It carries most of the processing load in the library functions it supports. Reliability, rapid recovery, and cost effectiveness are an inherent part of production operations.

Corbato <8> has identified the attempt to make more than one major advance at a time as one of the major problems of large system development. A conscious attempt was made to delimit the BALLOTS project by carefully excluding certain problems that were not considered researchable within the available time and resources. Among the problems BALLOTS decided not to attack were: (1) Input, storage, and output of non-roman alphabet records; (2) provision of extended graphic character representation for special characters and diacritical marks; (3) data compression; (4) searching aids for "near-hit" search arguments; and (5) use of very advanced techniques for handling bibliographic data that are still in the developmental stages, such as optical character recognition.

Even with focused effort the time for this project was estimated at three to five years. Any hardware used by the project would have to have an interface with the IBM 360/67 and be supported by the Computation Center. To promote transferability, it was decided that all the hardware used would be off-the-shelf equipment available as regular production items from established manufacturers.

1.5 System Goals

The problem under investigation is the technical, economic, and organizational feasibility of using a time-sharing system to service the file transaction functions of a large library. Technical feasibility means accomplishing the task with existing technology and software. Economic feasibility means accomplishing the task without increasing the library's budget beyond the savings that might result from the system within a reasonable payoff period (five to seven years). Organizational feasibility means accomplishing the task with existing library staff and with a minimum disruption to the library's regular activities.

1.5.1 Prototype goals

The implementation of the prototype system was confined to the technical processing activities of acquisition and cataloging, areas in which workloads have increased strikingly at all university libraries in the past ten years <11>. Certain major goals were selected for the prototype system.

1. Overcoming the geographic limitations of manual files by providing access to machine-readable files at any point where a computer terminal could be connected.
2. Lessening the effects of staff turnover on the consumption of professional time devoted to training.
3. Greatly increasing the sophistication of bibliographic searching by permitting users to combine multiple access points--such as author, title, and date--into a single search argument.
4. Reducing the amount of staff time--and the errors--associated with the maintenance of manual files.

5. Promoting the use of centrally produced, machine-readable files, such as MARC and ERIC data bases.

6. Generalizing the system design sufficiently to facilitate its export to other institutions with problems of similar scope and equivalent resources.

It is a fair question to what extent these goals were reached. In retrospect it appears that attempting to reach goals two and five with the prototype system was overambitious. Although it is likely that these goals can be achieved, the evidence from BALLOTS I is not conclusive. Goals one, three, and four were reached. Goal six was only partially attained (this is the subject of further discussion in section 3.6 of chapter 3.0). One outcome of BALLOTS I was a clear conception of the goals of BALLOTS as a production system, as well as of the goal of facilities to be shared with SPIRES. The following subsection describes the goals for BALLOTS II, for shared facilities, and, in the interests of completeness, of SPIRES II.

1.5.2 Production goals

In the research phase, BALLOTS collaborated with SPIRES (Stanford Physics Information REtrieval System), a project funded by the National Science Foundation. The two projects have hardware and software in common; these "shared facilities" are developed jointly. This has resulted in the maximum use of scarce and highly skilled system programming personnel and in a valuable cross-fertilization of ideas between related applications. The project goals for library automation (BALLOTS) and for generalized information storage and retrieval (SPIRES) are interrelated. The goal of shared facilities--both hardware and software--furthers and serves both of the intimately related projects.

Basically, BALLOTS is a transaction-oriented system that creates, adds, deletes, and modifies sets of frequently used records. BALLOTS thus supports the logistical aspects of bibliographic data processing, i.e. library activities, carried out under time constraints, that concern the flow of bibliographic information and library materials. This flow extends from among the technical processing staff to staff members, such as reference and circulation librarians, who interact directly with library users. SPIRES is a search- and retrieval-oriented system that provides access to bibliographic and other records created through transactions (i.e. BALLOTS activity) or furnished from outside sources (e.g. MARC). Librarians can use BALLOTS to create and manage their bibliographic files; they can also use SPIRES, to support the information retrieval aspects of their work. Non-librarians can search BALLOTS files to support their individual information-gathering activities. Each system is available to the user at a terminal without his needing to know which he is actually employing. This feature is exceedingly valuable because it means the user is offered a unified record management and retrieval system; he is not required to switch from one system to another.

BALLOTS

The university library is a complex combination of people, machines, and records that organize and open up the major bibliographic resources of the university to students and faculty. It reflects the needs and priorities of a changing university environment. As the major information center of a large academic institution, it must respond rapidly, effectively, and economically to the university community <36>. The university library is also part of a larger network of information sources that includes other research libraries, the Library of Congress, and specialized agencies of information storage and dissemination, such as professional societies and national abstracting and indexing services.

The essential goals of BALLOTS will be obtained in a combined manual-automated system that is:

USER RESPONSIVE. It adapts to the changing bibliographic requirements of diverse user groups in the university, and extends faster and more extensive bibliographic services into all campus buildings with appropriate terminals.

COST COMPETITIVE. It provides fast, efficient internal processing of increasing volumes of transactions at reduced unit costs.

GENERALIZABLE. It is not just an attempt to automate portions of the existing manual system; it can be separated from existing procedural, organizational, or physical settings. It is based on the actual operating requirements of library processing.

PERFORMANCE ORIENTED. It provides the library and the university administration with data that are useful for measuring internal processing performance and user satisfaction.

FLEXIBLE. It has the capability to expand in order to embrace a broader range of services and a wider group of users. Service via terminals will be available throughout the campus and to any non-Stanford user who has an appropriate terminal. The system will be able to link up with and serve other information systems, and effectively use national data sources such as MARC tapes.

These goals have been formulated into specific requirements that will, among other things, minimize manual typing, sorting, and filing; eliminate many clerical tasks now being performed by professionals; increase self-service efficiency; and provide mechanisms for recording the user's suggestions and reactions. The effect of these computer capabilities will be to reduce sharply the errors associated with manual sorting, typing, proofing, and hand transcribing; to speed the flow of material through library processing; to aid book selection by providing fast access to central automated files; and to enable librarians to advise an inquiring patron of tne exact status of a work before it is cataloged and placed on the shelf. In summary, responsiveness to library users, efficient operation, generality, performance monitoring, and flexibility for future improvements are the essential goals of library automation.

SPIRES

The SPIRES generalized information storage and retrieval system will support the research and teaching activities of the library, faculty, students, and staff. Each user will be able to define his requirements in a way that automatically tailors the system response to fit his individual needs. The creation of such a system is a major effort, involving the study of users, source data, record structures, and file organization, as well as considerable experimentation with facilities. The SPIRES system will be characterized by flexibility, generality, and ease of use. The goals of SPIRES will be attained in a system that has the following characteristics.

DATA SOURCE AND CONTENT. It will store bibliographic, scientific, administrative, and other records in machine-readable form. Collections will range from large public files, converted from centrally produced machine-readable data, to medium-small files, created from user-generated input--e.g., faculty-student files or data created by the administration of the university.

SEARCH FACILITIES. It will provide for searching files interactively (on-line) via a computer terminal; on a batch basis, by grouping requests and submitting them on a regular schedule; and on a standing request basis, in which a search query is routinely passed against certain files at specified intervals.

FEEDBACK. It will provide reports on how frequently various system components are used. These will include statistical analyses of user problems and system errors.

RECORD MODIFICATION. It will provide update and editing capabilities on a batch basis or on-line; options for update will come at the level of record, data element, and character string within a data element.

COST AND CUSTOMERS. It will provide services at a cost sufficiently low to enable a wide range of customers to cost-justify their use of the system. The variety of services should be sufficiently great to encourage a growing body of users. A range of services at various cost levels must be offered to permit users to select the service that meets their needs within their financial resources.

BALLOTS AND SPIRES SHARED FACILITIES

Shared facilities are the hardware and software designed to provide concurrent service to both BALLOTS and SPIRES applications. Because the sharing of such resources means a substantial saving to all applications served, maximum attention will be given to the sharing concept. Wherever possible, advantage will be taken of the economies gained through providing major facilities for multiple applications.

HARDWARE. The hardware environment will provide reliable, economical, and flexible support of applications.

SOFTWARE. The software, consisting of an operating system, an on-line executive program, a terminal handler, a text editor, and other facilities, will be used jointly by various applications. The operating system will be supplied by the manufacturer of the hardware.

GENERALITY/EXPANDABILITY. The shared facilities will be designed to allow new applications to be added without modifying previous ones.

2.0 PROTOTYPE DEVELOPMENT

This chapter records the development and operation of the BALLOTS I prototype system. Since this report period also covers the first six months of activity in developing the BALLOTS II production system, some of the results of that effort will be included. This will show by contrast many of the lessons learned from the prototype experience. In various sections, the problems encountered in development will be frankly discussed, to make this report as valuable as possible to other libraries that may be considering large on-line system development. Not every project's problems will be the same but knowing the problems of previous efforts may prevent repeating them. Further problems of and requirements for on-line system development will be discussed in Chapter 3.0.

2.1 Organization and Staff Facilities

It was assumed at the outset of BALLOTS I that a large, computer-supported bibliographic control system could not be developed independently by the library. Expertise of a kind not normally found in the library would be required. The initial effort called for refining and extending the preliminary systems analysis of major technical processing functions that had been conducted as part of proposal preparation. To do this and begin the work of the project, the University's Systems Office assigned four full-time analysts to work under the supervision of a systems coordinator. Quarters for this staff were furnished in the library, close to the functions being analyzed.

None of the newly assigned systems analysts had previous library experience and all demonstrated a now rapidly disappearing attitude toward library automation--underestimation of task complexity. Immediately on beginning employment, all were given intensive bibliographic orientation and instruction by members of the library staff.

The scheme of having an assigned task force belonging to an organization outside of the library was fine in theory, but worked out poorly in practice. Members of the task force worked in the library and their work was performed on behalf of the library. Yet there was an uncomfortable ambiguity surrounding their reporting and supervision requirements. At times, it appeared to the library that the project and its staff "belonged" to the Systems Office, and that the matters in which the library was interested were not receiving the full attention of the staff. Indeed, at one point, an assigned staff member was taken away from the project on short notice and assigned a different responsibility. Through negotiations, the library and the Systems Office succeeded in terminating this semi-contractural arrangement after some 15 months of less than completely satisfactory "collaboration." The assigned staff from the University's Systems Office was formally incorporated into the structure of the University Libraries. The Automation Division (now Department) was established under the BALLOTS Principal Investigator, Allen B. Veaner, who was a senior administrative officer of the library. A library analysis/design group manager reported directly to the department head. Later, Data Preparation and Data Control units (see subsections 2.10.2 through 2.10.4) were established within the department as part of prototype operations. This resulted in improved supervision and communication, and increased the library's commitment to automation. This organizational change also enabled the systems staff and the librarians to work together as professional colleagues, members of the same organization, rather than as outsiders to each other.

Six months before the start of Project BALLOTS, Edwin B. Parker of Stanford's Department of Communication began Project SPIRES--the Stanford Physics Information REtrieval System--a reference retrieval experiment aimed at servicing the need of high-energy physicists for rapid dissemination of preprints. Such dissemination is one of the key methods of these specialists for communicating the results of their experiments. Professor Parker had participated in the development of the BALLOTS Proposal and was already a member of the BALLOTS Faculty Advisory Committee. It quickly became evident that BALLOTS and SPIRES had numerous common system requirements and goals and needed identical computer facilities for their research. In the interest of securing the best return from their respective research grants, and with the full knowledge and cooperation of their respective funding agencies, the two principal investigators agreed to share and coordinate the intellectual resources and talents of the teams each had developed. An explicit goal of this collaboration was the creation of common software useful for both library technical processing and information retrieval. The University endorsed this collaborative approach and established a joint SPIRES/BALLOTS Executive Committee to monitor progress and to be certain that each project was indeed fulfilling its responsibilities to its respective funding agency. Each project continued to maintain its separate identity with respect to fiscal accounting and reporting requirements. The Executive Committee is composed of the Vice President for Research (now Provost), William F. Miller; the Director of Libraries, David C. Weber; the Director of the Stanford Computation Center, Charles Dickens (replacing Paul Armer); Professor Parker; and Mr. Veaner.

Collaboration between BALLOTS and SPIRES in the research phase produced many benefits, but separate management and separate quarters made some aspects of coordination and communication unwieldy. The analysis staff was in the Main

Library and the programming staff was in the Institute for Communication Research, two-thirds of a mile away, near the Campus Facility Computer. Often, daily contact between analysts and programmers is necessary. Documents and design plans need to be jointly discussed. In this situation a telephone is a poor means of communication. Following the decision to develop a production system for both BALLOTS and SPIRES, two significant changes occurred: integration of the two separate staff units under a single director and physical unification of the combined staff under one roof.

A.H. Epstein, formerly of the North American Rockwell Company and a key computing participant in that company's role in the APOLLO project, was appointed SPIRES/BALLOTS Project Director in the Stanford Computation Center in November 1969. At the same time, Mr. Epstein was appointed to the Project Executive Committee. Mr. Epstein was given a joint appointment in the Computation Center and the University Libraries as a result of an internal reorganization in the University Libraries. Mr. Veaner, formerly Assistant Director for Automation and head of the Library's Automation Department, was appointed Assistant Director for Bibliographic Operations, with responsibility for Acquisition, Automation, and Cataloging. Mr. Epstein was appointed Head of the Library's Automation Department as well as Director of the SPIRES/BALLOTS project in the Computation Center. These appointments strengthened the coordinated management of the joint BALLOTS/SPIRES project by ensuring that the Library's interests would be integrated into Stanford's long-range plans for computational facilities and services.

The existence of development staff in two separate locations had resulted in numerous difficulties in communicating and reaching a common understanding about various aspects of software design. Concurrently with the hiring of Mr. Epstein, the Executive Committee moved to collocate the entire staff. The Library supported the installation of a new temporary building, adjacent to the Computation Center, solely for the use of the SPIRES/ BALLOTS Project. This building was occupied in February 1970.

Staff turnover can be a serious problem. During 1968 and 1969 the project lost two key analysts and three programmers, including the manager of the programming group. The scarcity of talent, plus high demand in the library automation and programming job market, make job shifts a constant threat to development schedules and substantive design work. Orienting, and in some cases training new staff members, slows down development by consuming experienced staff time, even after a concerted attempt has been made to recruit and retain competent technical staff. Plans must be made against the contingency that key people may be lost. Adequately documenting all system development activities seems to be the best way to reduce the impact of losing staff members.

An illustration of the project organization is shown as Figure 2 on the following page.

2.2 Project Review and Control

2.2.1 Review

Early in the project a Faculty Advisory Committee was established with the following members:

Paul Armer, then Director of the Stanford Computation Center;

Richard Atkinson, Professor of Education and Professor of Psychology;

Kenneth Creighton, Controller;

Sidney Drell, Department Director and Professor, Stanford Linear Accelerator Center;

Stanley Hanna, Professor of Physics;

J. Myron Jacobstein, Professor of Law and Librarian of the Stanford Law Library;

William R. Kincheloe, Senior Research Engineer, Stanford Electronic Laboratories;

Joshua Lederberg, Professor of Genetics, Stanford Medical Center;

William F. Miller, Professor and Vice President for Research;

Edwin B. Parker, Associate Professor of Communication;

Rutherford D. Rogers, then Director, Stanford University Libraries (now Director of the Yale University Library);

Arthur Samuel, Senior Research Associate and Lecturer, Computer Science Department;

Wilbur Schramm, Director, Institute for Communication Research;

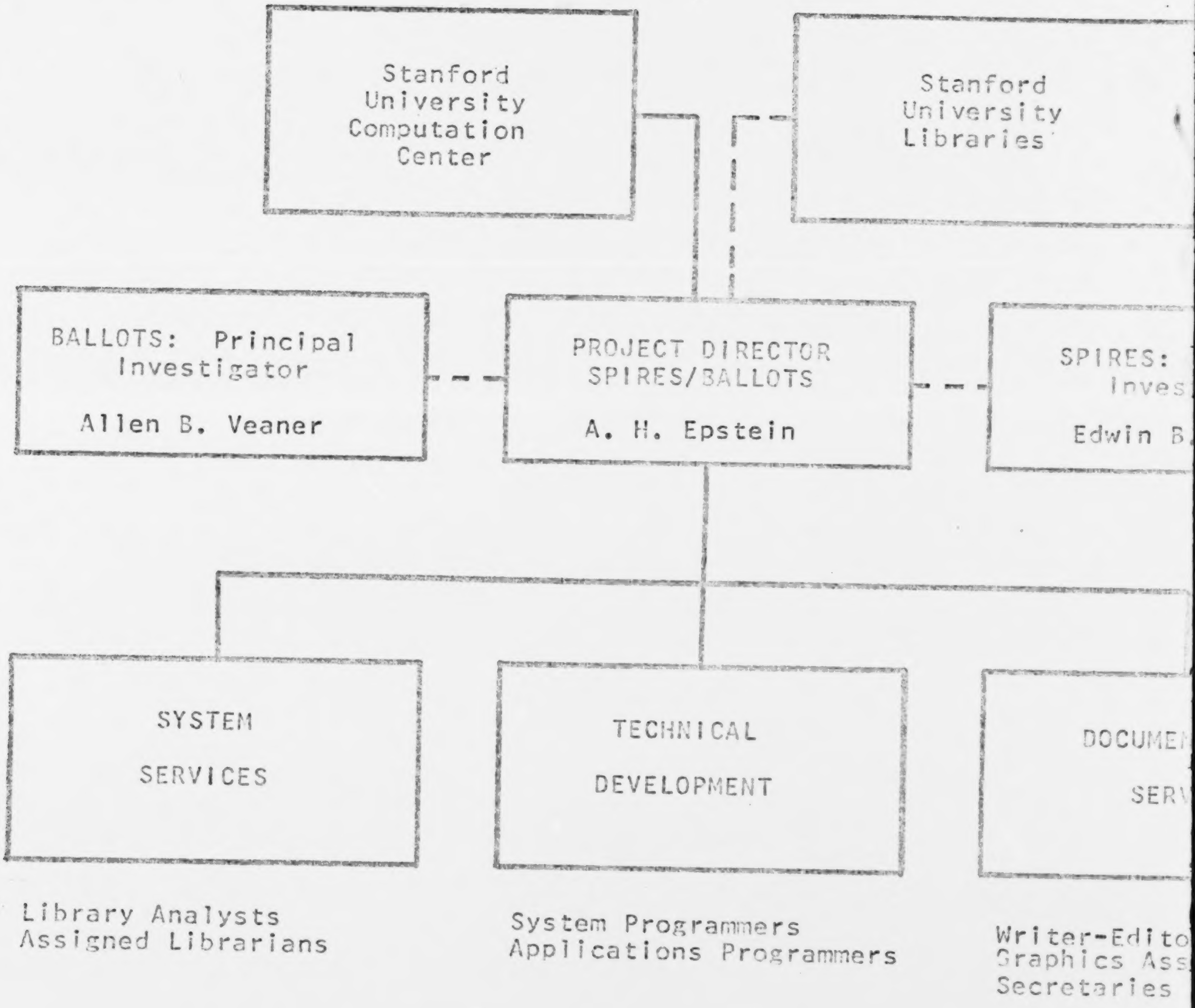

Stanford University Computation Center
Stanford University Libraries
BALLOTS: Principal Investigator
Allen B. Veaner
PROJECT DIRECTOR SPIRES/BALLOTS
A. H. Epstein
SPIRES:
Inves
Edwin B.
SYSTEM SERVICES
TECHNICAL DEVELOPMENT
DOCUMEN
SERV
Library Analysts
Assigned Librarians
System Programmers
Applications Programmers
Writer-Edito
Graphics Ass
Secretaries

Figure 2
Project BALLOTS Organization

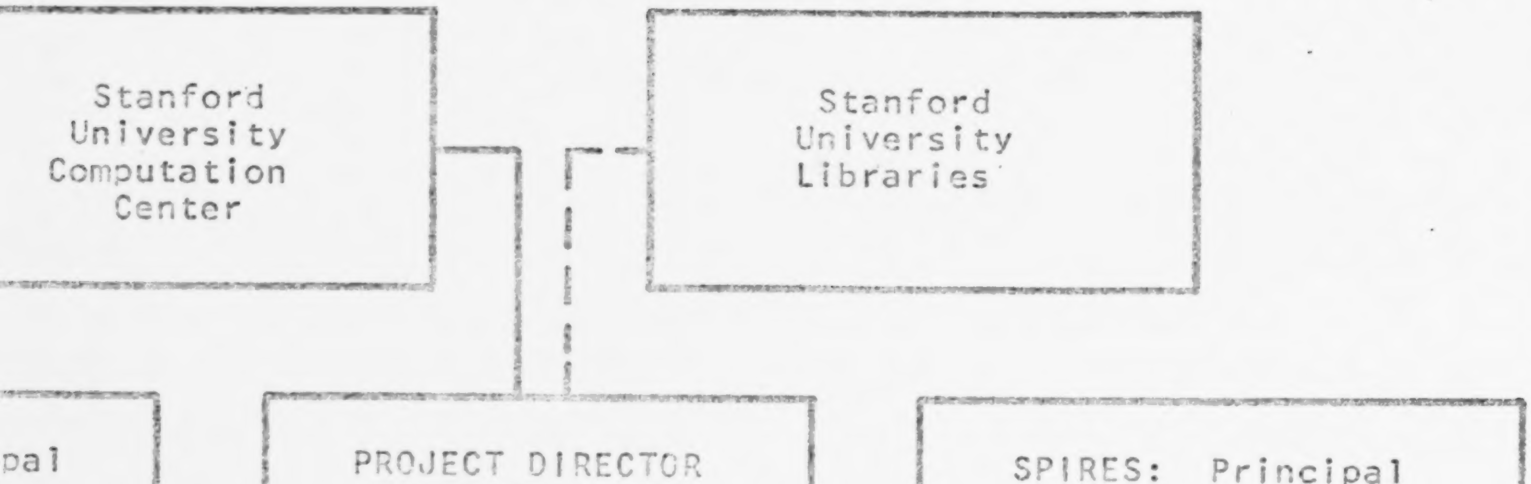

Stanford
University
Computation
Center
Stanford
University
Libraries
pal
r
PROJECT DIRECTOR
SPIRES/BALLOTS
A. H. Epstein
SPIRES: Principal
Investigator
Edwin B. Parker
TECHNICAL
DEVELOPMENT
DOCUMENTATION
SERVICES
ns
System Programmers
Applications Programmers
Writer-Editors
Graphics Assistant
Secretaries

Figure 2
Project BALLOTS Organization

Claude M. Simpson, Professor of English;

Allen B. Veaner, Assistant Director for
Automation, Stanford University Libraries;

David C. Weber, then Associate Director),
Stanford University Libraries (now Director).

The committee met quarterly to review progress, report the views of the faculty on library automation, and offer their assistance with problems. Copies of the project's quarterly reports were furnished to the committee as a basis for discussion. The Faculty Advisory Committee was dissolved when the SPIRES/BALLOTS Executive Committee was established.

The Executive Committee concerns itself chiefly with the examination and resolution of any internal matters that might hinder the two projects, such as the establishment of appropriate overhead rates for dedicated hardware, personnel evaluation, and the recruitment of managerial staff and systems programmers. The committee also reviews major reports and proposals prior to their submission to funding agencies. The committee keeps the project informed about other related projects and interests on the campus that might have similar software and system requirements. Several have been identified, and the efficacy and practicality of the common software concept thus further strengthened.

In the spring of 1968, an External Advisory Committee was formed to bring outside expertise into the project for purposes of review and evaluation. The members of the External Advisory Committee, all of whom serve without compensation, are:

Mrs. Henriette D. Avram, Head, MARC Development
Office, Library of Congress;

Joseph Becker, President, Becker & Hayes, Inc;

Donald V. Black, Systems Development Corporation;

Richard DeGennaro, Director of Libraries,
University of Pennsylvania;

Samuel Lazerow, Chairman, National
Libraries Automation Task Force, Library
of Congress;

Stephen A. McCarthy, Executive Director,
Association of Research Libraries;

Rutherford D. Rogers, Director, Yale University Library;

Charles H. Stevens, Associate Director
for Library Development, Project INTREX.

Two original appointees, Carl F.J. Overhage and Lawrence Buckland, were unable to continue serving on the committee and were replaced by Charles H. Stevens and Donald V. Black, respectively. James E. Skipper, formerly Executive Secretary of the Association of Research Libraries, filled in for the Association's Executive Director, Stephen A. McCarthy. The External Advisory Committee met in May 1969 and in January 1970. Its comments and evaluations are sent directly to the Office of Education.

An additional reviewing method consists of regular site visits by Robert L. Patrick, a computer specialist experience in on-line text-processing and bibliographic data applications. Mr. Patrick also contributes to major decisions on system design, hardware selection, and communication networks.

2.2.2 Control

A major purpose of a formal System Development Process (see subsection 2.5.2) is to break down the development effort into a series of manageable and interrelated tasks. Taken together, these tasks enumerate exhaustively the work required to produce a fully operational system. The tasks must be specifically and uniquely identified for assigning and scheduling. Breaking down the development effort into individually assignable tasks is the only way in which the management can control its resources and guarantee that the development effort will terminate at a definite time, producing an operational system.

Within each development phase, tasks are assigned and coordinated by means of a Task Control Sheet (see Figure 3 on the following page). This form is prepared jointly by the person assigning the task and the person responsible for completing the task. It is initialed by both and contains a task completion date, a statement of the purpose of the task, a task description, and a statement of interfaces and constraints. All assigned tasks are recorded on weekly and monthly schedule forms (see Appendix 6.7). These display all the tasks of a project staff member. When the task is finished to the satisfaction of the responsible person, it is stamped "COMPLETED" and is added to the project's formal documentation. It is also marked as completed on the schedule form of the responsible manager. No task is accepted as complete without its accompanying documentation.

After the task has been completed, hindsight comments are added, perhaps recording ways in which the task might have

1. DISTRIBUTION: HE DF JS EM WD
PERSON(S) ASSIGNED: D. Ferguson
OTHER: AV, DW

PAGE 1 OF 1

2.

TASK NO.:	PHASE
B C D .008 S	B

COMPLETED DATE 5/14
APPROVED 9/1E

TASK CONTROL SHEET

3. PERSON(S) ASSIGNED: Doug Ferguson INITIALS: DF DATE: 4/17
ASSIGNED BY:: Hank Epstein INITIALS: DATE: 4/17
USER: INITIALS: DATE:

4. TASK COMPLETION DATE: 4/23/70

5. PURPOSE OF TASK:

Forms, Standards B-1 to B-15
(DS.101 - DS.115)

6. TASK DESCRIPTION:

1) Finalize instructions, forms and samples for all Forms.
2) Instructions on Standards pages with numbers assigned.
3) Xerox adequate number of forms and establish Master Copy storage, availability, and revision system.
4) Xerox adequate copies for Project Control Notebook.
5) Write Documentation Standard (DS.100) detailing 3.

7. INTERFACES/CONSTRAINTS:
Must be ready for Project Control Notebook distribution on 4/24/70

Final copy of forms and instructions to Documentation by 4/21/70

8. HINDSIGHT COMMENTS:
5/14/70 – Should help to retrieve past documentation when required by individual, etc

Figure 3

been performed more efficiently, or citing problems that had not been anticipated. Material from this section is expected to provide valuable information for the future development of BALLOTS as well as for other library automation projects.

A significant feature of the Task Control Sheet is that it must be approved by any user who is affected. For instance, the Head of the Acquisition Department is asked to approve the outcome of every task relating to his area of responsibility. This gives users a practical orientation to the System Development Process, as well as ensuring that the user is intimately involved in the design of the system intended to serve him. The Documentation Standard (DS.002) describing the use of this form and a complete sample are in Appendix 6.7.

2.3 Library Environment

The libraries of the Stanford campus consist of two groups. Most are part of the Stanford University Libraries headed by David C. Weber, who reports directly to the Provost of the University. In addition, there are six coordinate libraries (such as Law and Medicine), each of which is headed by a librarian who reports to the dean of the school or to the director of the supporting institution. These two groups are linked through the University Library Council chaired by Mr. Weber. Altogether there are over forty libraries on the campus and they employ over five hundred people.

The Stanford University Libraries have a collection of 1.8 millon volumes (the total for all libraries on the campus is about 3.5 million). The annual operating budget is approximately four millon dollars. The staff of the libraries includes 87 professional librarians and 174 library assistants. Stanford University Libraries catalogs about 55,000 to 60,000 titles each year and acquires about 50,000 new titles every year. Figure 4 illustrates the size and growth of the Stanford University Libraries. For further information on the organization of the libraries, size, and growth factors, see Appendix 6.1. BALLOTS is designed initially to serve the Stanford University Libraries.

2.4 Computer Environment

The Stanford Computation Center consists of three major facilities: An IBM 360/50 at the Medical School, an IBM 360/91 at SLAC (the Stanford Linear Accelerator Center), and an IBM 360/67 at the Campus Facility. (The Controller's Office operates an IBM 360/40, designated the Administrative Computing Facility. Organizationally, this facility is not a part of the Stanford Computation Center.) The Campus Facility's machine is the University's main computer for support of research and teaching

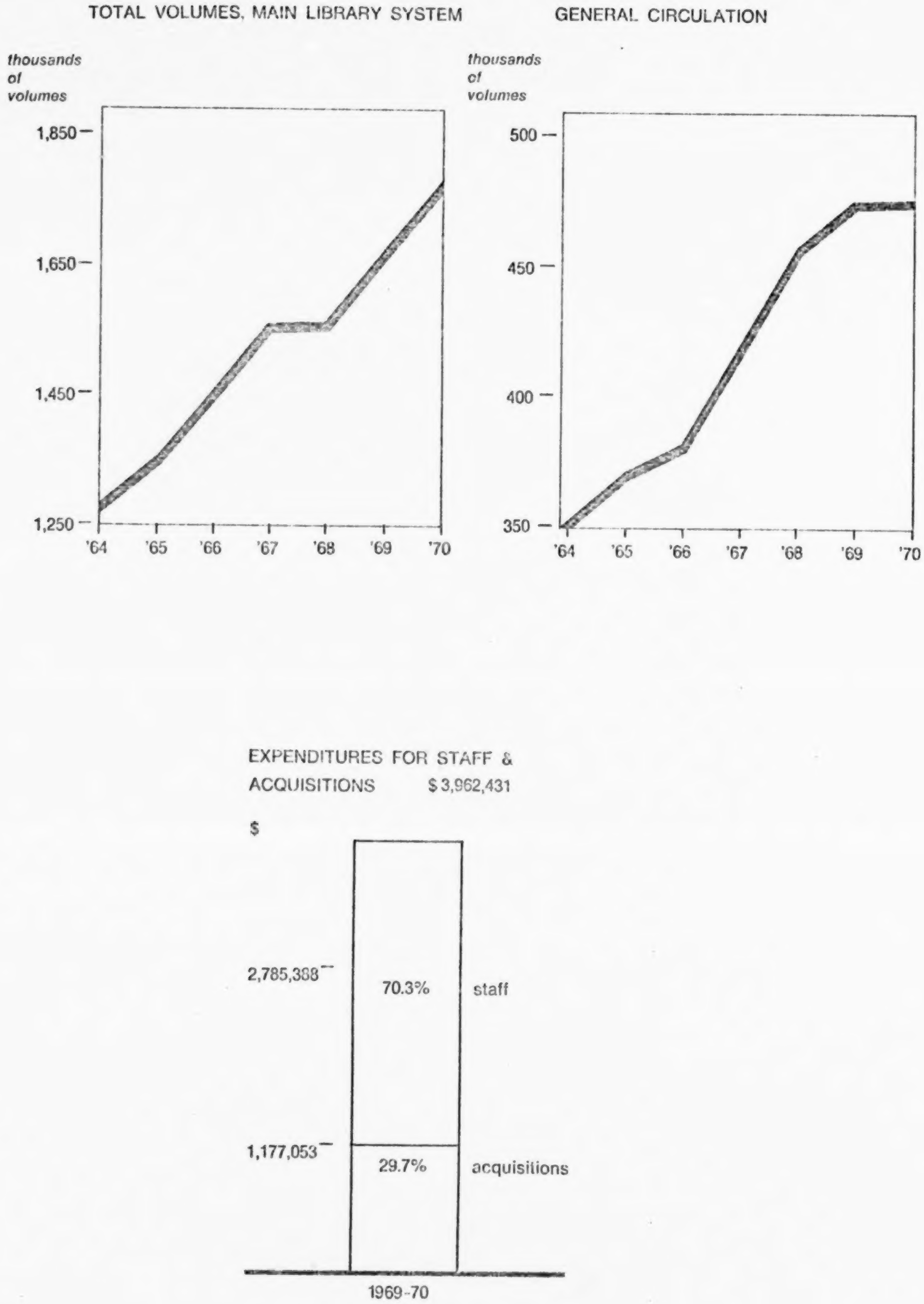


Figure 4
Growth of the Stanford University Libraries

in the schools of Humanities and Sciences, Education, Earth Sciences, and Engineering. All three facilities serve approximately 5,000 users, and all offer terminal services. The Campus Facility is open 24 hours a day, seven days a week, and provides 136 hours per week of public services, the remaining time being set aside for hardware and software maintenance. Each major facility is headed by a Director, all of whom report to the director of the Stanford Computation Center. The project director of BALLOTS and SPIRES also reports to the director of the Stanford Computation Center.

It is important for the reader to be aware that the Main Library and the Campus Facility are approximately a mile apart. This is a limiting factor on, for example, the rapid availability of highspeed printer output.

2.4.1 Computer and peripheral equipment

During BALLOTS I, Stanford's IBM 360/67 contained the following major components:

1 CPU
1,048,576 bytes of core
2 7-track tape drives
2 9-track tape drives
4 2314 disc storage units
3 2301 drum storage units
3 1403 printers
1 1443 printer
2 2540 card read/punches
2 2501 card readers
1 2703 transmission control unit
8 2260 display units

(The IBM 2260's, used to display job status within the computer system, were removed from service in November 1970 and replaced with Hazeltine Model 2000 displays.) Approximately 200 IBM 2741 typewriter terminals are available for public use at various locations around the campus; a number of these terminals are installed at various schools and colleges in the Bay area in support of a regional network. Portable terminals are available for use with the networks maintained by common carriers. At any given time, eighty of the 200 IBM 2741 typewriter terminals can be using the 360/67 simultaneously. On the Stanford campus, almost all terminals are permanently connected to 360/67 the over voice-grade telephone lines. A number of terminals can be switched to use with the 360/50. Dialing facilities are available for communicating with other computers outside of Stanford. Portable terminals are also available for off-site demonstrations or for places where a fixed installation is inconvenient or impossible. Eight teletypewriters are also supported. The full equipment configuration is shown in Appendix 6.2.

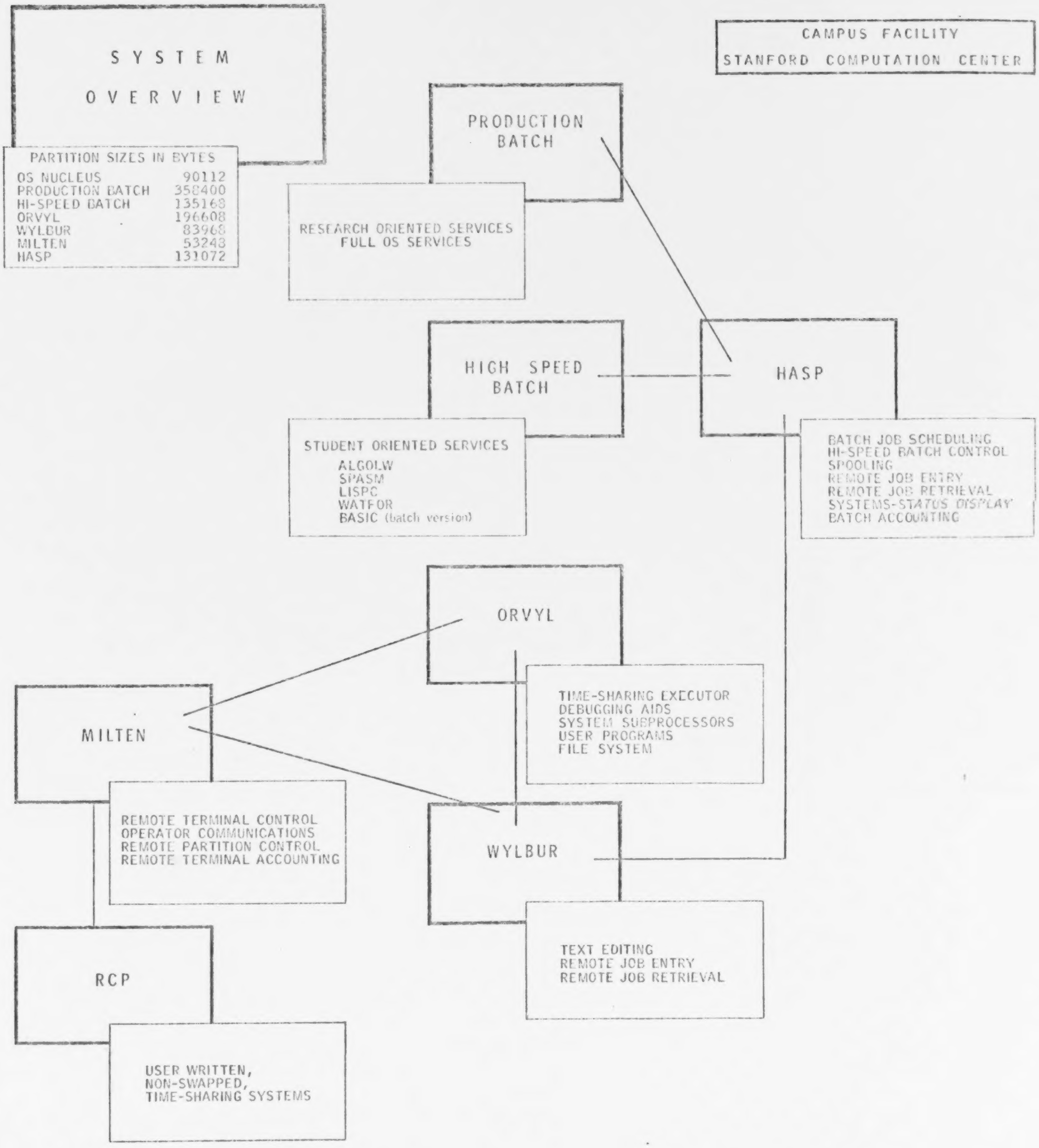
A steam-driven turbine provides a dependable source of electric power, independent of the hazardous line surges that characterize the electric power grid in this region, and of other dangers as well. The turbine was installed following disastrous damage to the 360/67 on March 12, 1970, when an automobile rammed a utility pole feeding the substation that supplied electricity to the Computation Center.

The initial proposal for Project BALLOTS envisaged use of the IBM 2321 Data Cell for mass storage. This device, with a rated capacity of four hundred million characters, was attractive owing to its economy: twice the storage capacity of the 2314 disk for less than half its cost. The known penalty would have been in access time, which was expected to be four to five times the 85-millisecond average access time on the 2314. A 2321 Data Cell was installed on the 360/67 on November 21, 1968--but it was removed on December 1, 1968, owing to the manufacturer's inability to guarantee mechanical reliability and service dependability. The device was also under-utilized while it was available and hence could not be economically justified. (The 2321 was removed before BALLOTS was able to make significant use of it.) However, there were two other reasons why the 2321 Data Cell proved impractical: access to records stored on it proved to consume 360/67 overhead unduly--which all but destroyed its cost advantage over the 2314; and the time required for checkpointing its contents (periodic copying to back-up tapes) proved excessive--eight to ten hours to dump a full Data Cell onto tape. Since it is the Campus Facility's policy to checkpoint direct-access storage devices every two weeks, this is a real economic drawback.

Rejection of the 2321 left only one available choice: the IBM 2314 disk, a storage device that has shown a high degree of reliability in the field. On the average, it takes less than an hour to dump a full 2314 disk onto tape. A 2314 for shared use by BALLOTS and SPIRES was installed on December 21, 1968, along with a dedicated selector channel to speed data transfer. Although it would have been possible to utilize an existing channel, channel equipment was already shared among three 2314's. An attempt to attach one more 2314 would have resulted in queuing or contention, with consequent unacceptable delays in getting to records.

2.4.2 System software

The software environment as of June 1970 is illustrated in Figure 5 on the following page. Employing IBM's OS/MFT (multiprogramming with fixed number of tasks), the IBM 360/67 offers batch processing, terminal text editing, remote job entry and retrieval, and time-sharing services. The OS nucleus is


SYSTEM OVERVIEW
CAMPUS FACILITY
STANFORD COMPUTATION CENTER
PRODUCTION BATCH
RESEARCH ORIENTED SERVICES
FULL OS SERVICES
HIGH SPEED BATCH
STUDENT ORIENTED SERVICES
ALGOLW
SPASM
LISPC
WATFOR
BASIC (batch version)
HASP
BATCH JOB SCHEDULING
HI-SPEED BATCH CONTROL
SPOOLING
REMOTE JOB ENTRY
REMOTE JOB RETRIEVAL
SYSTEMS-STATUS DISPLAY
BATCH ACCOUNTING
ORVYL
TIME-SHARING EXECUTOR
DEBUGGING AIDS
SYSTEM SUBPROCESSORS
USER PROGRAMS
FILE SYSTEM
MILTEN
REMOTE TERMINAL CONTROL
OPERATOR COMMUNICATIONS
REMOTE PARTITION CONTROL
REMOTE TERMINAL ACCOUNTING
WYLBUR
TEXT EDITING
REMOTE JOB ENTRY
REMOTE JOB RETRIEVAL
RCP
USER WRITTEN,
NON-SWAPPED,
TIME-SHARING SYSTEMS

PARTITION SIZES IN BYTES	
OS NUCLEUS	90112
PRODUCTION BATCH	358400
HI-SPEED BATCH	135168
ORVYL	196608
WYLBUR	83968
MILTEN	53248
HASP	131072

Figure 5
360/67 Software Configuration

stored in the OS partition. Other partitions illustrated in the figure are as follows:

HASP (Houston Automatic Spooling Process). Controls peripheral input-output devices (readers, punches, printers); handles priority scheduling for two categories of batch work and performs batch accounting functions; maintains system status information (core utilization, number of jobs backlogged, etc.).

MILTEN. Provides communication for terminal-oriented systems, such as ORVYL, SPIRES/BALLOTS, and WYLBUR. It facilitates broadcasting by the operator and inter-terminal communication by system users.

ORVYL. A time-sharing monitor that permits programs written by users to execute in a time-sharing mode.

WYLBUR. A text-editing and remote job entry facility. (See subsection 2.10.2 below for further details on how WYLBUR is employed in support of BALLOTS).

HI-SPEED BATCH. An extremely fast performing batch partition designed expressly to expedite the execution of short jobs submitted by students. Works independently of the OS job scheduler.

PRODUCTION BATCH. A large partition supporting all OS services; the workhorse for complex research computing tasks.

The rates established for service on the 360/67 are based on a government-approved flexible pricing agreement, which has been documented by Nielsen <19>. Under this agreement, costing and pricing are separated, and an effort is made to spread the cost of various machine resources in a way that is beneficial to the users. Flexible pricing permits a fair and reasonable allocation of scarce or expensive resources that might otherwise be beyond the reach of system users. It permits the income from popular facilities (such as terminals and remote job entry) to be applied to less used but still essential facilities. A significant feature of the government-approved flexible pricing arrangement is that the Campus Facility must charge all users the same rates for equivalent services. This policy had a major effect on the economics of implementing BALLOTS on Stanford's IBM 360/67 as configured in 1969-70, and will be dealt with separately in section 3.2.

Appendix 6.2 contains a chart of rates in effect during 1969-70 for all users of the Campus Facility.

2.5 Library Analysis and Design

The libarary analysis group is responsible for analyzing the current procedures, deriving library operating requirements to be fulfilled by the computer system, and designing a manual system that effectively uses the computer system.

2.5.1 BALLOTS I analysis and design

Library analysis for BALLOTS I meant the study of manual files, documents (input and output), and data elements, including descriptive (e.g., format) and quantitative information about each system element. This task was carried out by the library analysis group working with the library staff. From the information gathered, the analysis staff produced specifications on record content, indexes, data elements, and output formats.

Defining the data elements was a basic system requirement. In order to define data elements, it was decided to follow the analytical approach suggested by Bregzis <6> rather than the traditional approach. In the analytical approach, the functional relationship of an access point to the total bibliographic record is given priority over the set conventions for naming data elements. All personal names associated with a given record are accorded equal weight in the analytical approach, whether they are main entries, joint authors, editors, etc., on the ground that the ultimate library user does not consider these niceties when he is searching for a particular work. Nor, without a good deal of training, does the non-professional searcher in a library technical processing department.

Data elements were defined for three categories of data:

control data
full LC bibliographic data
accounting data

Each data element was defined by a standard name, a mnemonic (of one to three letters), a maximum and minimum length, and content editing where applicable. For each data element there were edit requirements in the data base build program, for whether it was singular or multiple, whether it was required in a record or not, and what its content specifications were (such as all numeric or all alphabetic). A personal name bibliographic main entry was tagged "A" for personal name. Its functional relationship to the work (main entry) was indicated by a separate data element "ME" that pointed to the main entry. Likewise, a second personal author was also tagged "A" and its functional relationship to the traditional structure of bibliographic records indicated by a supplementary element. Ninety-seven data elements were thus defined for the prototype system. The list is included as Appendix 6.6.

The analysis staff's specifications were given to the programming staff, usually in the form of Library System Notes (see section 2.6). If explanations were needed, meetings were held between the staffs. The library's inexperience in writing on-line specifications was apparent; equally, the programming staff underestimated the complexity of library requirements. Communicating changes to specifications was not adequately controlled.

2.5.2 The system development process

A comprehensive system development process was employed at the beginning of the project and continues to be refined and extended. When the decision was made to develop a production system, the process was named the BALLOTS II System Development Process. A graphic representation of the elements of each part of the process is given in Figure 6 on the following page.

The System Development Process has six overlapping phases, each with a specified documentary output. The six phases are:

1. Preliminary Analysis
2. Detailed Analysis
3. General Design
4. Detailed Design
5. Implementation
6. Installation

The Detailed Analysis Phase is described in some detail in subsection 2.5.3 because this is the most recent and significant BALLOTS II library activity.

Preliminary Analysis, based on experience with the BALLOTS I prototype, involved defining goals, describing the user environment, analyzing the existing system, selecting the system scope, and establishing the gross technical feasibility of the BALLOTS I implementation scope. This work is described in detail in a System Scope document <25> that was the main documentation output of the Preliminary Analysis phase.

Detailed Analysis enumerates system requirements minutely. Performance requirements are stated quantitatively, including response time, hours of on-line accessibility, allowable mean failure time, maximum allowable recovery time, and similar factors. Record input and output are determined in terms of volume, growth, and fluctuations. Timing considerations for batch input and output are determined, in order to plan for

SYSTEM DEVELOPMENT PRO
PHASES AND PRODUCTS

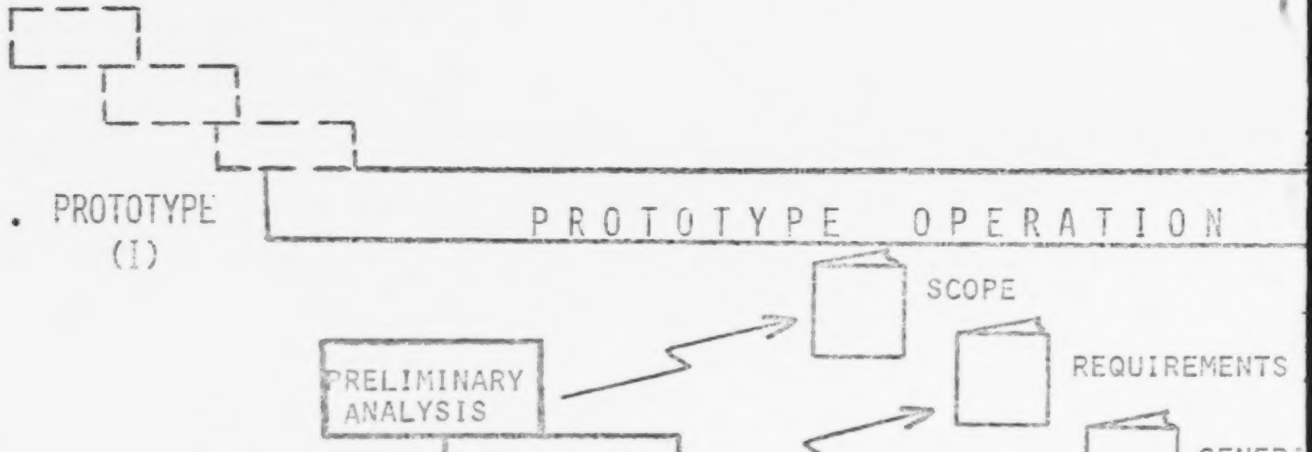

PROTOTYPE
(I)
PROTOTYPE OPERATION
SCOPE
REQUIREMENTS
GENERA
PRELIMINARY ANALYSIS
DETAILED ANALYSIS
GENERAL DESIGN
DETAILED DESIGN
IMPLEMENTATION
INS
PRODUCTION ENGINEERED
(II)
FUTURE DEVELOPMENT CYCLES
(III)
PRELIMINARY
ANALYSIS
DETAILED

Figure 6

YSTEM DEVELOPMENT PROCESS
PHASES AND PRODUCTS

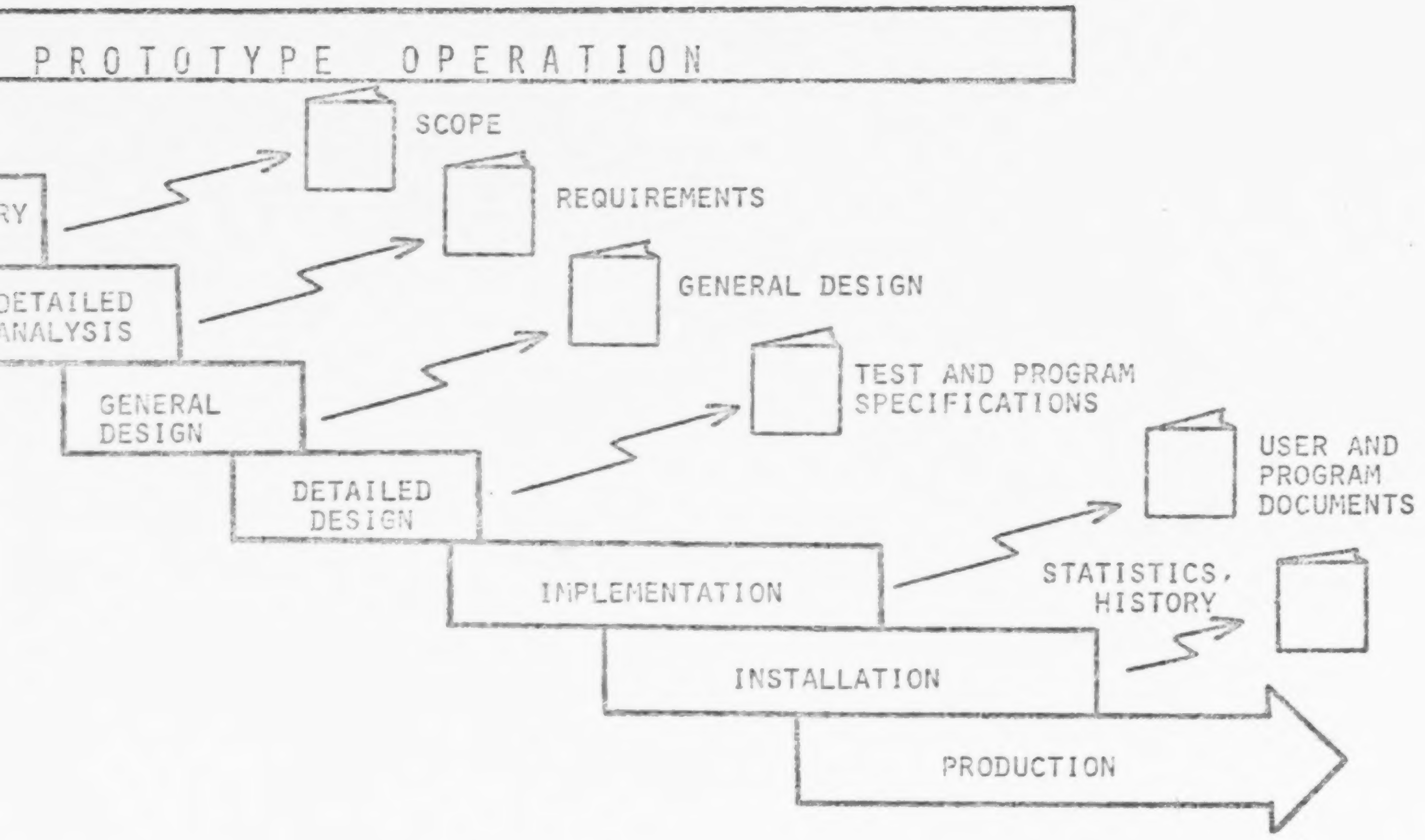

PROTOTYPE OPERATION
SCOPE
RY
REQUIREMENTS
DETAILED
ANALYSIS
GENERAL DESIGN
GENERAL
DESIGN
TEST AND PROGRAM
SPECIFICATIONS
DETAILED
DESIGN
USER AND
PROGRAM
DOCUMENTS
IMPLEMENTATION
STATISTICS,
HISTORY
INSTALLATION
PRODUCTION
ARY
ANALYSIS
DETAILED
ANALYSIS

Figure 6

scheduling requirements. All input and output record, screen, and document formats are determined character by character. Rules transforming input data elements into output data elements are formulated and tabulated. The upper bounds of developing and operating costs are established.

General Design encompasses both system externals (procedures, training, reorganization, etc.) and system internals (alternative hardware and software solutions to the stated requirements). As a result an overall software-hardware configuration is selected and outlined in a General Design document.

Detailed Design completes the internal and external design, creates implementation and testing plans, and provides programming specifications. These factors are incorporated in a Detailed Design document.

In the Implementation phase, user documentation is created and personnel are trained. Programs are coded and checked. Testing is done and the results are evaluated. Programs, maintenance documentation, and test reports are written up in this phase.

In the Installation phase, files are converted, and following a period of parallel operations, during which the full system is evaluated and accepted by the library, a complete changeover is made to the new system. Performance statistics for the production environment are gathered over a ninety-day period. A support plan for continued operation of the system and a project history giving system details are completed.

All the activities that occur during the system development process are scheduled and evaluated at key milestone points.

2.5.3 BALLOTS II detailed analysis

In the Detailed Analysis Phase, the precise, detailed requirements of an automated library bibliographic processing system are defined, analyzed and presented. These requirements cover every function the system is to perform--they form a complete description of WHAT the system is to do. Basic to this task is a detailed system design/description that aids understanding and clarifies various analysis subtasks. The library is viewed extensively as a series of interrelated subsystems. In depth, it is viewed as a series of progressively more detailed levels of activity. To define precisely these levels of activity, a hierarchical model has been postulated:

LEVEL	EXAMPLE
Subsystem	Acquisition
-Process	-Ordering
--Procedure	--Create new record
---Operation	---Key data
----Step	----Key single data element

Preliminary analysis description was primarily at the subsystem level. Detailed Analysis concentrates on processes, their component procedures and operations. For each subsystem process a book is prepared that contains data flow charts and analysis forms. The book as a whole presents a design scheme showing at what points (using CRT screens) records will be input, updated, and copied from file to file; at what points files will be searched; and at what points printed output will be generated.

Detailed Analysis looks at the elements of the library system, determines which are important, and gathers information about them. In both its automated and its manual portions, the library is a file oriented processing system. Thus, information is needed about the description and contents of records and files. Data elements in these records also must be identified and described unambiguously. Each process of a system produces several outputs (usually but not always printed) from several inputs. The data elements in the input are transformed in the course of processing; their transforms must appear correctly on the required outputs. Hence, inputs must be described, printed outputs formatted, and processing rules stated unambiguously. A system employing video displays, such as BALLOTS II, has particularly stringent requirements for accurately describing and specifying the format, content, and processing rules for the display screens. System interfaces must be described and system controls stated. Performance requirements of cost, timing, and schedules are established, and any organizational requirements (such as a new organizational unit, like Data Control) and training requirements (such as a terminal operator training program) are described. In addition, any computer system rests upon certain assumptions and concepts that require management decisions. To promote clarity and completeness, these are developed and put in writing for discussion and approval. Appendix 6.4 contains a list of representative assumptions and concepts, along with the management decisions that were presented to the library administration for discussion, modification, and, finally, approval.

The information gathered is needed in precise--preferably in quantitative--detail. Size, volume of activity, and frequency of occurrence are typical of the required measure.

Performance requirements are stated quantitatively, including such factors as response time, hours per day of on-line service, and allowable mean time between failures. Record input and output are estimated in terms of volume, growth, and fluctuations. All input-output documents are laid out in character-by-character detail. Transformation rules between input and output data elements are specified and cost limits established.

In presenting the needed information, the volume and complexity of bibliographic processes virtually rules out use of a narrative format. Well-designed forms are the most convenient medium for recording and displaying the quantitative and qualitative data necessary to establish system requirements. About twenty forms forms have been designed and tested for BALLOTS II. A draft copy of each form was developed and criticized. A standard was next written giving instructions for filling out the form. This ensured uniformity in data collection and presentation. After several critiques, representative and comprehensive examples of completely filled out forms were prepared. This effort resulted in thoroughly pretested and documented forms known to be satisfactory to the analysts and librarians. A complete set of analysis forms and their associated documentation standards is given in Appendix 6.3.

Thus, the Detailed Analysis Phase enumerates the complete functional requirements of the production system. The results of the Detailed Analysis Phase are to be presented in a requirements document. An example of a requirements document is the document for the Acquisition Subsystem, which totals over 600 pages. It is estimated that the combined set of subsystem requirements documents that will make up the BALLOTS II Requirements Document will total approximately 2,000 pages.

2.6 Internal Project Documentation

In BALLOTS I, library specifications were presented in a series of Library System Notes. Technical specifications were presented in a series of Computer System Notes. Examples of both types of notes are in Appendix 6.6. Library analysis data was prepared on forms and collected into notebooks. Requirements for library processing (e.g., use of MARC tapes) were prepared as Library System Notes and forwarded to the programming group. Design specifications implementing these requirements were prepared as Computer System Notes and reviewed in turn by the library analysts. Interpretations or elaborations of documents prepared by one group required making extended telephone calls or holding meetings at the library or the Campus Facility. There was no formal change control procedure for documents, and this resulted in documentation that was incomplete and inconsistent with the design. Although this documentation was suitable for prototype development, developing a production system requires more complete, detailed, and controlled documentation.

An on-line bibliographic control system for a large library is incredibly detailed. For example, the requirements document for the Ordering Process in the Acquisition Subsystem totals 300 pages, and over 600 pages are needed to specify the system requirements for the entire Acquisition Subsystem. Preparing, organizing, and updating large amounts of complex documentation requires the highest degree of standardization and discipline. A recent major work on data processing management <23, p. 11> states that

> <The system development process> puts documentation where it belongs: equal in importance to analysis, design, and programming. More management effort often must be exerted to obtain good documentation than is required to obtain good analysis, design, or programming because analysts and programmers, upon completion of those segments, feel that they have completed their assignments. Unless documentation standards are both clearly designed and rigorously enforced, however, the resulting documentation will be both garbled and inconsistent in quality.

Two major tools for managing project documentation have been the development of standardized analysis and design forms and the use of computerized text editing, to maintain and update both forms and narrative material. Indeed, without the ready availability of the text-editing system, it is doubtful that a project of this magnitude could maintain consistent internal documentation.

A Project Control Notebook is maintained, in which all project documentation standards are enumerated and defined, and all forms explained, with examples. A copy is issued to every staff member and to librarians who are participating in system development or are expected to be major system users. Figure 7 is a partial listing of the contents of the Project Control Notebook.

Documentation is controlled by the Project Editor, who is assisted by a support staff responsible for producing finished documents from material prepared by the project staff, as well as distributing and maintaining them. In general, a task is not considered complete until it has been documented (see section 2.2). This fact has proven exceptionally effective in assuring rapid delivery of documentation materials.

Each type of system component in the BALLOTS II system--procedure, file, record, screen, hardcopy input or output--is

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1.3 Personnel
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DS.005 Identification of Draft Documents
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DS.113 Naming/Numbering Conventions
DS.114 System Flowcharts--Symbols and Conventions
DS.115 Name List--Data Element Names
DS.116 Name Lists--System, Subsystem, Process, Files
DS.117 Manual Procedure Abstract Form (B-13)

Figure 7
Project Control Notebook Contents Page

identified within a unique mnemonic-numbering format, prefixed by a system or subsystem mnemonic. Each subsystem is assigned a two-character mnemonic, such as CT for Cataloging and AQ for Acquisition. Each process within a subsystem is assigned a three-character mnemonic. Each procedure within a process is serially numbered. In the Ordering Process of the Acquisition Subsystem, there is a procedure in which a librarian keys a search request for the MARC file. This is a manual-automated procedure followed by an automated procedure in which the MARC file is searched and various output screens displayed. Following are this and some other system elements with their identification codes.

SYSTEM ELEMENT	ID#
Acquisition SUBSYSTEM	AQ
Ordering PROCESS	AQ.ORD
Key MARC search PROCEDURE	AQ.ORD.13
Search MARC file PROCEDURE	AQ.ORD.18
MARC FILE	BMRC
Search inquiry screen (INPUT)	AQ.ORD.SI01
Search result screen (OUTPUT)	AQ.ORD.SR01

The proper identification code appears on each form describing a system component, and throughout the project documentation that system component is referred to by its identification code. The code structure shows what procedures are part of the same process and what screens are part of the same process. The file code shows, for example, that the MARC file (MRC) is available at various points throughout the BALLOTS II (B) system. The naming/numbering conventions for constructing identification codes are given in Appendix 6.4. A listing of all subsystems, processes, and files, with their associated codes, is given in Appendix 6.4 also.

The flow of data through bibliographic processing is presented in the form of system flow charts. These charts, along with the naming/numbering conventions, are intended to ensure communication between librarian-users and the library analysis group, and between library analysts and the programming group. Between users and analysts, they are intended to maximize understanding and they also form the basis of management's approval of the proposed system flow. Between analysts and programmers, they form part of the documentation necessary for writing program specifications. A common understanding of system charts is achieved by defining a set of symbols and their interpretations, and specifying conventions in the use of, for example, flow lines and comments. Appendix 6.4 contains the detailed standard employed for BALLOTS II flowcharts.

2.7 Software Design and Development

BALLOTS I software design and development was carried out by the combined BALLOTS/SPIRES programming staff at the Institute for Communication Research. Specifications were provided by the library analysis group. The overall system design called for creation of an on-line In Process File. Records of bibliographic data (including all information necessary for acquisition and cataloging) were to be created and updated from input entered at terminals in the library and files were to be searchable on-line. Data copied from MARC tapes was to be used in creating the record whenever possible. Purchase orders, claims, cancellations, and catalog cards are the needed outputs. To support this a structure was created which included an on-line executive, search and retrieval programs, a file building programs, and programs for printed outputs.

2.7.1 On-line executive program

The prototype system supervisor is an on-line executive program designed and developed by project personnel to service several on-line users simultaneously. The purpose of an on-line executive program is to regulate competition for service and resources among several terminal users. The program attempts to ensure that each user gets a reasonable share of available execution time. Experience with the the prototype supervisor has demonstrated the feasibility of the approach taken; response time averages three seconds for simple search requests. The scheduling algorithm in the time-sharing monitor allocates CPU cycles according to the priority of each partition. (See subsection 2.4.2 for review.) SPIRES/BALLOTS I performed in the production batch partition. Hence, a request for service by any other partition except High-Speed Batch automatically pre-empted CPU cycles. On days when activity was high, the response time for SPIRES/BALLOTS was degraded, an inevitable result in this particular computing environment.

Details of the on-line executive program are contained in the BALLOTS Quarterly Report for the period ending June 25, 1969 <2>.

2.7.2 Internal file structure

The Internal file structure minimizes the need for extensive reorganization of the file when new materials are added. New references are added to the data base in whatever order they are received. A major objective of the file structure design is to avoid serial searches; such searches are tolerable on very small collections, but cannot be made efficient for files of the size contemplated by BALLOTS. Instead, access to the appropriate references is achieved through a series of inverted index files. Each indexing term in the files is followed by a list of pointers indicating the locations of the references in the data base that contain that indexing term. In the prototype system the following indexes were defined:

- Author
- Title word(s)
- Corporate author
- Conference author
- Identification number
- Topic

The Topic index was not implemented in BALLOTS I because subject access to the library's In Process File was not required by the library staff during prototype operations. (However, subject access was provided for ERIC files and for the file of African History references.) The date of each document is stored with each address pointer in each index. This makes it possible to restrict searches to specific dates without having to use the master file of bibliographic records and without having to establish a separate date index, which could produce unmanageably large stacks of pointers.

2.7.3 Data base format

One or more logical records (bibliographic entries) are stored within a physical record or "block." For the prototype system this block length was set at 3,520 bytes (eight-bit characters). The organization of a data base block is shown in Figure 8. The first two bytes contain the block number, the second two bytes contain the number of entries in the block, and the third two bytes contain the location of unused space within the block. The last four bytes in the block are a trailer containing an address pointing to the actual location of the first logical record within the block. This trailer is the address pointed to by the index files. Should it prove necessary to expand the logical record so that it no longer fits within the space originally assigned, then it can be located in some other space (not necessarily in the same block) and the trailer changed to indicate that location. No modification of the existing index files would be required when such a change is made (unless index terms were deleted).

There are several possible ways in which the logical record itself might have been organized. Potentially, a large number of data elements might be associated with each bibliographic record. Inasmuch as over four hundred data elements have identified by Curran and Avram <10>, it would be a very inefficient use of space to assign a fixed-length record

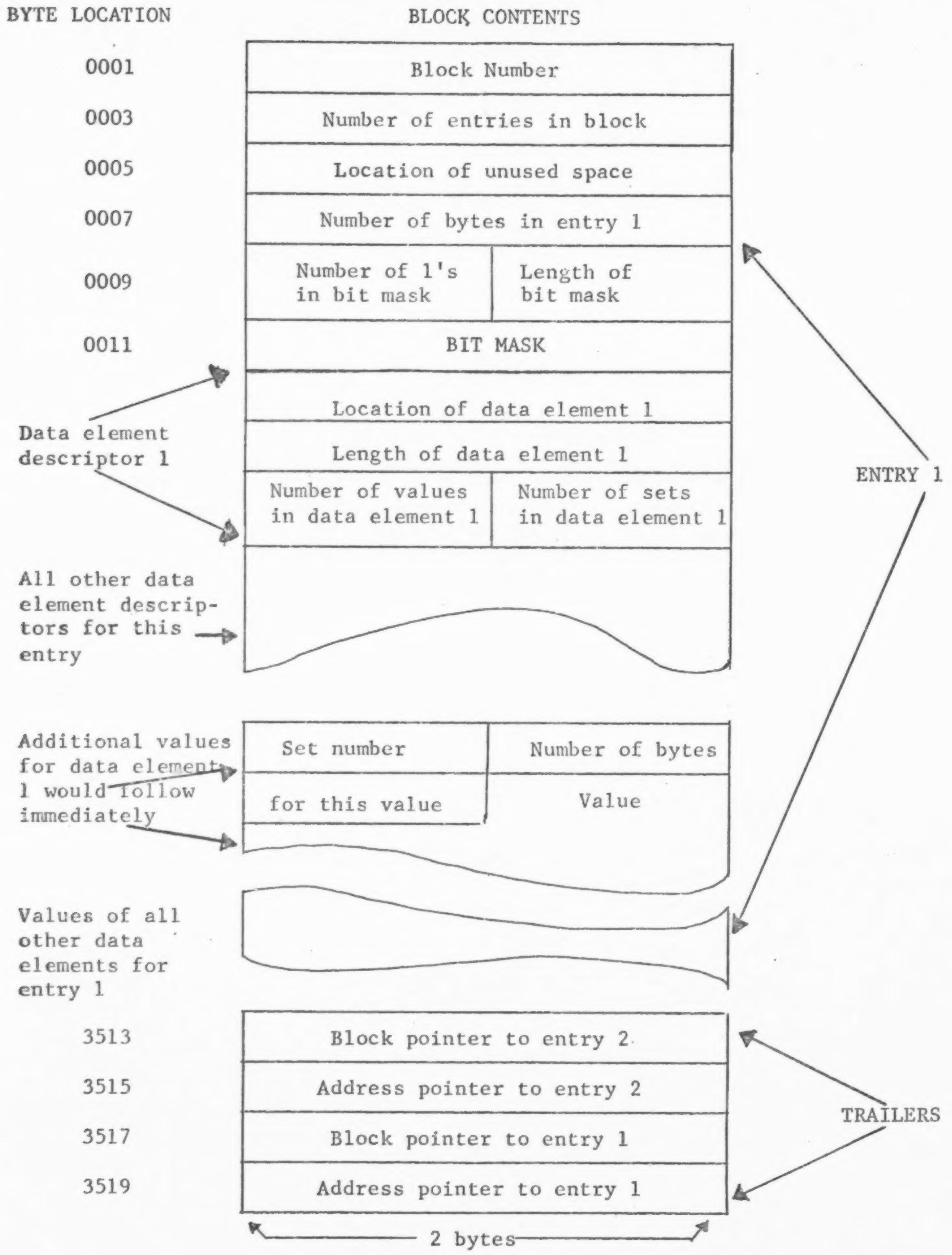

BYTE LOCATION
BLOCK CONTENTS
0001
Block Number
0003
Number of entries in block
0005
Location of unused space
0007
Number of bytes in entry 1
0009
Number of 1's in bit mask
Length of bit mask
0011
BIT MASK
Data element descriptor 1
Location of data element 1
Length of data element 1
Number of values in data element 1
Number of sets in data element 1
ENTRY 1
All other data element descriptors for this entry
Additional values for data element 1 would follow immediately
Set number for this value
Number of bytes
Value
Values of all other data elements for entry 1
3513
Block pointer to entry 2
3515
Address pointer to entry 2
3517
Block pointer to entry 1
3519
Address pointer to entry 1
TRAILERS
2 bytes

Figure 8
Data Base File Format

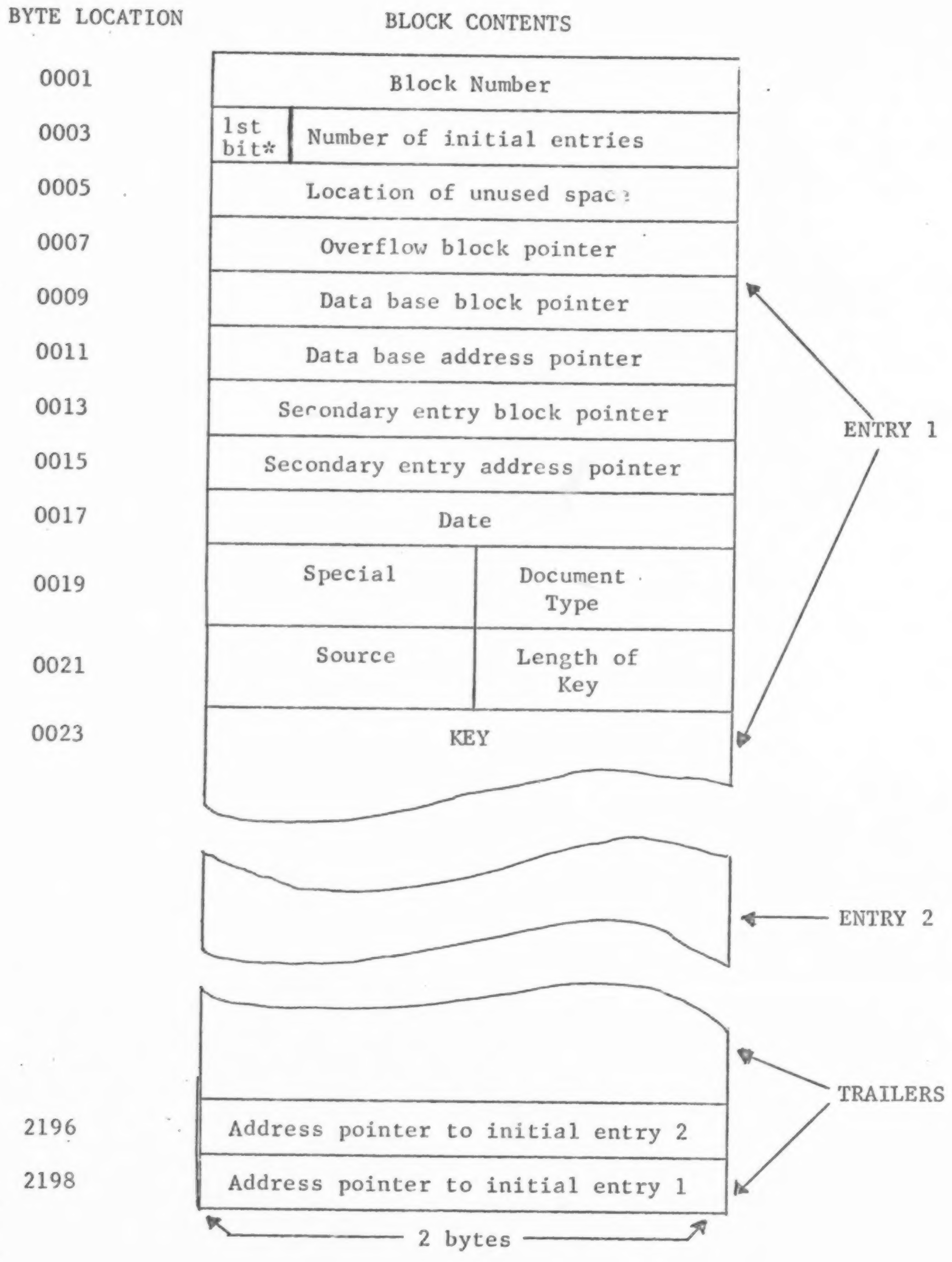
format for each possible data element, or even to assign a fixed-length heading for each possible data element with a variable-length record only for those actually present. One feasible alternative is to have a variable-length-heading field consisting of pairs of labels and pointers. The retrieval of any particular data element (e.g. author) would begin by searching the first half of each pair until the "author" label was found, and then proceeding to the location specified by the associated pointer to find the variable-length author field. Another, the alternative chosen for this project, was to have a system data element descriptor table in which each possible data element is numbered in approximately descending order of frequency of occurrence. This data element number can then correspond to the position in a "bit mask" or "bit table" at the head of each logical record. For example, when data element number 16 is present, the 16th bit (i.e., the last bit in the second byte) can be set to 1. When it is absent, that bit can be set to 0. Thus a "fixed-length heading" for 32 possible data elements can be stored in one four-byte word. When all the remaining bits in a bit heading are zero, then the bit heading itself can be truncated to the nearest byte. For each data element actually present in the given logical record, a fixed-length heading indicates the starting location of that data element, the length of that element, the number of values present (e.g., the number of authors) and the number of "sets" into which those values are grouped. One example of the flexibility this last feature permits is the grouping together of authors from the same institution into the same "set," in such a way that there is a one-to-one correspondence between sets of authors and sets of institutions. This file organization requires a mixture of alphanumeric-integer and bit-string values within a variable-length record.

The first two bytes in the logical record indicate the total number of bytes in the entry. The next two bytes indicate the number of data elements present for that entry (the number of 1's in the bit mask) and the length (in bytes) of the bit mask. The bit mask itself follows. After the bit mask there is a series of six-byte headings, one for each data element present. (The third heading would be for the third data element present, i.e., whatever element is associated with the third 1 in the byte mask.) The first two bytes of the six indicate the location of the value, the second two bytes indicate the length, the fifth byte indicates the number of values in the element and the sixth indicates the number of sets. Within each variable length, the first byte indicates the set number for the first value (e.g., the first author), and the next two bytes indicate the length of that value. Each succeeding value is preceded similarly by three bytes of descriptive information.

2.7.4 Index file organization

In the prototype system, data base files (themselves created by the computer programs that read in the "input format" discussed above) are read into the index building programs to create the index files. The logical plan of the structure for each index is that about half the available space will be divided into physical blocks (for example, perhaps 300 blocks). A "hash coding" calculation, treating the bits of the index term as if they were integer numbers, is used to select one of the possible blocks for each index term. A similar calculation on retrieval will permit the search to be immediately narrowed to the appropriate section of the index. The remainder of the indexing space will be used for overflow blocks, linked to whichever of the basic index blocks have been filled up. This scheme permits efficient retrieval without linear searches of a large index file, and without requiring reorganization of the index file whenever new entries are added. There is no commitment to stay with hash coding as the primary index access procedure. A balanced tree structure might well be more efficient. The hash coding scheme was easy to implement as a first version and permits the collection of statistics necessary to create balanced tree structures.

Within each block in each index file there are two index terms (such as an author's name) and secondary entries (for all following occurrences of references with the same index term). Trailers at the end of the physical blocks point to each initial entry. Secondary entries are chained together and to the corresponding primary entry by a series of pointers. Figure 9 shows the organization of one block in the index file. The first two bytes contain the block number, the next two contain the number of initial entries in that block, the fifth and sixth bytes indicate the location of unused space within the block, and the seventh and eighth bytes indicate the address of the following overflow block. Two-byte pointers to the address of initial entries within the block are in the trailers at the end of the block. Each primary and secondary entry has first the four-byte pointer to the corresponding data base entry from which that index term was taken. The next four bytes contain the address of the next secondary entry. This is set to zero if there are no additional secondary entries. Two bytes are reserved for the date of the reference being indexed, one byte for the type of entry (e.g., monograph, journal preprint, conference paper, and so forth), one byte for the source (i.e., MARC or other data tape service), and one byte is reserved for special use in each index. Each primary entry has in addition a byte indicating the length of the variable-length indexing term or key plus that index key itself.



BYTE LOCATION	BLOCK CONTENTS	
0001	Block Number	
0003	1st bit*	Number of initial entries
0005	Location of unused space	
0007	Overflow block pointer	
0009	Data base block pointer	
0011	Data base address pointer	
0013	Secondary entry block pointer	
0015	Secondary entry address pointer	
0017	Date	
0019	Special	Document Type
0021	Source	Length of Key
0023	KEY	
2196	Address pointer to initial entry 2	
2198	Address pointer to initial entry 1	

*If the 1st bit of byte 0003 is "on" (1, not 0), then there is an available space chain in the block.

Figure 9
Index File Format

This index structure has proven workable in the prototype system but it can be improved upon. Substantial modifications are planned for BALLOTS II.

2.8 TERMINAL SELECTION

As documented in the MARC Final Report <1>, the conclusions of the RECON Working Task Force <7>, and the work of the University of California Institute of Library Research <7>, the input problem is universally recognized as the key issue in building the files required for automated bibliographic control. Hence, a prime concern at the beginning of BALLOTS was to determine the method of keying bibliographic records.

The use of paper-tape devices was rejected at the outset for several reasons: the evidence of poor reliability from the MARC I experience; the difficulty of handling, identifying, and storing segments of tape; the difficulty of making corrections; and the lack of paper-tape-handling equipment in the Computation Center. (It should be noted that not all library experience with paper-tape typewriters has been negative <14>.) Even if the center had had such equipment, it is doubtful that tape would have been employed, because of the first three reasons.

In preparing data for the computer-produced book catalog of the J. Henry Meyer Undergraduate Library, Stanford had amassed considerable experience in using punched cards for entering bibliographic data. This experience, which has been documented by Johnson <13>, established the feasibility of handling diacritical marks, capitalization, and special characters by means of key punching--at least for a collection limited to undergraduate materials, and characterized by a rapid decline in new input once the initial collection was established. But it seemed that the keypunch method should not be extended to comprehend special characters beyond the 100 graphics defined for the Meyer catalog, nor should it be used for the sizable input and update requirements of a large research library. Keypunching would have been especially unsuited to the rapid update requirements of on-line systems.

The on-line typewriter terminal was chosen as the input device for several reasons: ready availability; existence of ready-made software (WYLBUR) for text editing; and the desire to employ terminals expressly designed for use with an on-line computer system. Since terminals were already required to reach and search on-line files, they could be used for input with no added hardware costs.

Following are the features of the IBM 2741 terminals for use on Stanford's IBM 380/67 <38>:

REQUIRED: EBCD keyboard
Dial-up facility option
Dual data 1, type ball 963 print element

OPTIONAL: Interrupt
Typ-a-matic
Reverse break

The reverse break feature is a standard item present on all Stanford terminals. It enables any on-line terminal to communicate with any other active terminal. The graphic character set available on the IBM 2741 Model 1 with type ball 963 contains:

LOWER CASE

abcdefghijklmnopqrstuvwxyz
0123456789
-&@$#,./

UPPER CASE

ABCDEFGHIJKLMNOPQRSTUVWXYZ
)=<;:%'>*(
_+¢!"|¬?

Note that a significant number of these graphics had been selected for computer programming applications. Included in these were:

<>*#|¬

It would have been possible to design special encoding routines and to write the programs required to embed special graphic characters within the conventional 2741 character set. However, this would have required an additional programming effort clearly outside the scope of a BALLOTS prototype implementation.

Examination and use extablished the utility of WYLBUR (the text-editing and remote job entry software) for entering bibliographic data. This eliminated the need to write special terminal monitoring facilities and text editors, and freed project programmers to work on developing the on-line search facility. Using WYLBUR eliminated the need for terminal users in the Stanford environment to learn two different command languages or become accustomed to two different terminals. It also did away with the need for additional core and CPU (central processing unit) resources to support a different text editor.

Some disadvantages accompanied the decision to use the IBM 2741 typewriter terminals and WYLBUR. The IBM 2741 is delivered in three different code configurations. To establish a campus standard--considered essential if consistent, dependable service was to be offered--the Computation Center chose a terminal that emits EBCDIC code. This choice, made prior to the establishment of BALLOTS and without bibliographic applications in mind, was considered a given in project development. Accordingly, it was decided that BALLOTS would not attempt to solve the problem of graphic character representation, especially since it was already being worked on by the Information Systems Office at the Library of Congress. The difficulty of this problem has been well described by Cunningham et al. <9>.

The ready availability of video terminals as standard hardware in third generation computing equipment offered the attractive possibility of doing away with the noise and slow response time of typewriter terminals. The Stanford Computation Center agreed to provide software support for IBM Model 2260 video terminals to be installed in the library, but the IBM 2260 equipment presented problems almost at once, well before the proposed installation date, and the order was cancelled.

IBM 2260 terminals had already been installed at the Computation Center for monitoring and displaying system status to staff and users. The Computation Center's evaluation of the device indicated its suitability for passive display and its relative unsuitability for negotiating searches or for text editing. (All IBM 2260's have since been removed from the Stanford Computation Center and replaced with Hazeltine Model 2000 units. The new units also are used only for passive display of system status to users and computer operators.) To satisfy the interest of Project BALLOTS in the 2260, a number of units were placed into normal service and made available for trials using WYLBUR and the on-line search facility, In each instance, it was quickly apparent that the IBM 2260 would not be a satisfactory communication instrument for bibliographic retrieval.

The 2260 is designed to function more like a fast typewriter than a flexible visual terminal. Like the typewriter terminal, it functions on a "line-at-a-time" basis, and is much more suitable for fixed format, fixed length data. To summarize the limitations of the IBM 2260:

1. The character repertoire is very limited and consists of upper case characters only.

2. Characters, formed by a 5 x 7 dot matrix, are of poor quality.

3. The writing speed is fairly slow. If messages must be written to many screens at the same time,

it might take as much as four seconds to fill an entire screen. Further, the addition of new data to any part of the screen requires rewriting the entire screen.

4. The Display Control Unit (IBM 2848) operates as a commutator that services only one keystroke request at a time. When any one key is being serviced, other terminal keyboards are locked out and the typist's rhythm broken up.

5. Several units examined exhibited line distortion at the edges of the screen, an indication of maintenance or design inadequacy.

6. Units lacked the "typ-a-matic" feature. Continuous operation of the space bar or back space was not possible.

7. Two keystrokes are required for data transmission.

8. Cursor controls are slow and difficult to use.

9. Preformatted fields, such as data element tags, cannot be protected from user alteration.

Bibliographic messages vary widely in total length and in the length of each field. An effective bibliographic display system must be able to accommodate these variations and must offer the ability to display a large number of characters at a high writing speed. Part of the reason for the low data rate of the 2260 is the limitation imposed by the 2400-baud telephone line that links the computer to remote locations. With asynchronous transmission, a 2400-baud line limits the character transmission rate to a maximum of 240 EBCDIC characters per second--or four seconds to write a 960 character screen. A brief response message can be anticipated only when the searcher is seeking an exact match, i.e., when he already knows in advance exactly what he is looking for. In an acquisition system this is likely to occur during a receiving operation (when the book is in hand) but not during an initial search when the only information in hand is a book requisition. Thus, the searcher must be provided with substantial "playback" ability--he must be able to scan a large amount of data on the screen, possibly even looking at several records at once. It was felt in BALLOTS I that the user should be able to view a graded series of outputs, ranging from brief to full records, and that the minimum display capability should be 1,000 characters, although 2,000 to 3,000 characters were preferable.

The only way to achieve a data rate higher than that provided by a telephone line is to install a wide-band, high-speed data link, along with terminal equipment matched to the transmission facility. Two high-speed terminal systems were found that met the requirements for rapid display: the Data Disc Television Display System and the Computer Communications CC-30.

Following is a tabulation of the major features of each display:

Feature	Data Disc	CC-30
Character set	ANSI	ANSI
Dot matrix	7 x 10	5 x 7
Characters per line	64	40
Number of lines per screen	40	20
Total number of display positions	2560	800
Incremental cost of adding one display to system	$1,000	$7,800
Time to write a full screen with all displays active	1 second	1 second
Minimum cost to support a single display, not including computer interface	$38,000	$7,800

The Data Disc system was clearly advantageous for five or more terminals, since the cost of adding CC-30's was completely linear. The 7 x 10 dot matrix of the Data Disc was clearly superior to the 5 x 7 dot matrix of the CC-30 for lower case characters. An attractive feature of both systems was the ANSI set of 128 characters, which permits the display of all lower-case and many special characters. Equipment with ANSI code would have enabled BALLOTS to conform to the newly issued Federal Standard Code for Information Interchange (equivalent to ANSI code X3.4-1968), the same code in which MARC data were encoded and distributed. However, since the IBM 360/67 operates not on this code but on IBM's own EBCDIC code, little actual advantage would have accrued.

Unfortunately, the Data Disc system failed to perform properly in several demonstrations, and the manufacturer finally conceded that all data would have to be stored with 100 percent redundancy to guarantee performance. This immediately cut in half the disk storage capacity and correspondingly reduced the number of terminals that could be supported simultaneously. The manufacturer was also uncertain as to whether or not his devices could operate remotely at the distances between the Computation Center and the Library, approximately two-thirds of a mile including twists and turns. The high cost of adding one more terminal and the limited number of displayable characters ruled out the CC-30, and both devices were dropped.

For some time, the Campus Facility wanted to be able to view a "snapshot" of a full page of printed output, which is 132 characters wide and 60 lines long. This desire, coupled with requests from BALLOTS and many other users for graphic display capability, led the staff of the Campus Facility to investigate visual displays that would be inexpensive to purchase and would consume less core than the usual refreshed display does. With its own resources the Campus Facility installed a standard Tektronix 611 storage tube device, the same device that had been used in Project INTREX for passive display of remotely transmitted microstore images. A demonstration was conducted for BALLOTS, and the advantages and disadvantages were considered. The storage tube is basically an inexpensive means of displaying data that does not change very much or very rapidly for a reasonable length of time--up to 15 minutes. The image is written rapidly, is of high resolution, and is quite bright at first, then fades. The period of real image brightness is very short--less than a second. The residual image is optimally readable under shaded, protected conditions. Such conditions are not likely to be found in a modern library. Furthermore, using any passive storage display with a typewriter terminal for input involves two other disadvantages, the noise of the typewriter and the relatively slow response, owing to the complex electronic circuitry and the time delays in CPU data processing. The typewriter terminal does produce a hard copy of the search that could be used for operator training and evaluation. But the disadvantages of the terminal taken with those of the Tektronix 611 were too many, and the combination was judged unsuitable for BALLOTS.

Finally, the inability to use video terminals in BALLOTS I was related to the kind of service provided on Stanford's IBM 360/67. Most of the users are students and researchers performing interactive work at terminals. In support of their jobs, some 60,000 different data sets and programs are maintained on disk files. Each data set is brought into and out of core storage whenever it is being used, and computational results communicated back to the user through the terminal handler (MILTEN). A similar interaction takes place through WYLBUR, the text editor, whenever new programs and data sets are created. This means that any very active terminal system is handling intensive communication activity. Such activity has a direct bearing on the feasibility of using video terminals, because video terminals require bulk data transfer; i.e., the transmission of several thousand characters within a fraction of a second. In this respect, one video terminal is the equivalent of a number of slow-speed typewriter terminals. The required transmission rate is not a problem--this is easily handled by a coaxial cable--but the message-switching capacity might be overtaxed, and the "store and forward" capability of the Campus Facility's terminal communication system impaired. A limited number of remote terminal buffers and remote terminal control blocks (which take precious core) now service up to about eighty 2741 "line-at-time" terminals simultaneously. Each slow-speed terminal can accumulate up to 132 characters, and a "probability game" is played as to the length of time any user's line will be resident in the buffer before it is written onto disk or transferred elsewhere for processing. If all the buffers are full, the user is informed that his request for service has been queued. Several video terminals pre-empting valuable buffer space would significantly reduce the number of users able to use the facility.

As a footnote to this discussion of video terminals, it may be noted that many other devices were looked at, including the following: Philco D-21, Bunker-Ramo 2204, Stromberg Datagraphics SD 1110, Uniscope 300, Burroughs BIDS, Sanders 720, Raytheon DIDS-400, General Electric's Datanet-760, RCA 70/756-31, and Control Data 210. A number of these devices existed only as specifications at the time of inquiry. Some would have required extensive hardware and software preparations to interface with the 360/67. When terminals come along that are both better and cheaper, they will be obtained--but only if it can be proved beyond a doubt that they will function well in a production environment. Peripheral equipment--particularly if not made by the manufacturer of the main frame--cannot be purchased on the basis of promises and specifications.

2.9 On-line Interactive Searching

The on-line search facility described below was used by librarians and technical processing assistants.

2.9.1 Program residence

The BALLOTS on-line search facility resided in a 358,000-byte partition of high-speed core on the IBM 360/67. Since this arrangement pre-empted the Campus Facility's production batch, various attempts were made to work out alternatives. These included: (1) program overlays to reduce partition size, (2) installation of IBM bulk core, and (3) utilization of non-IBM high-speed core. The first alternative was rejected on the ground that response time would be unfavorably affected. The second alternative proved impractical since Stanford's IBM 360/67 was an early model without a connection facility for bulk core. The third alternative was very actively explored, but the vendor was not sufficiently confident in his product to guarantee performance, and all negotiations were dropped.

2.9.2 Search language

The search language, as implemented in the prototype system, is of the form

> find title classical studies and not title greek and (author john smith or author william jones) and date between June 1960 & 1963.

Subsequent statements may be added to narrow the search results to a smaller list of references meeting both the earlier and the later specifications; i.e., the new list is logically "and-ed" with the previous list. This implicit "and" can be overridden with an explicit logical "or" symbol (|) as the first symbol in a following statement, if the user wishes to expand rather than narrow the search.

When the resulting list of citations is sufficiently small that the inquirer wants to browse through the references found, then he can issue the command, "list" or "print." This displays on the typewriter terminal information about each reference in the sequence found.

The date search comes in three forms: "date between," "date before," and "date after." The date may be specified in any of the many forms in which the date can be cited in English (except roman numerals), with the one exception that if the date is specified as three numbers then the order is presumed to be, month, day, year. (If a user mistakenly uses the European or military order of day, month, year, then confusion might arise.)

Authors' names may also be presented in almost any form. If they are presented surname first, a comma must separate the surname from the given names or initials. If the names are presented in the usual surname-last position, then the program presumes that the surname is that character string following the last embedded blank in the name. This presents a problem for surnames containing blanks (e.g. Ten Kate); hence all such names are entered into the index twice, once under the full surname and once under the final part of the surname. In the author searches, all possible matches with the query name are recovered. For example, a search for author J. B. Smith would find all references by James Brian Smith, John B. Smith, J. Bruce Smith, etc., as well as J. B. Smith. A search for James B. Smith would find all references by J. B. Smith, James Smith, and J. Bruce Smith as well as James B. Smith.

The "title" search is in fact a title word search. In the example given, all citations with the word "classical" and "studies" but not the word "greek" in the title would be retrieved, regardless of the order of occurrence and regardless of whatever other words are contained in the titles of citations meeting those specifications.

In both title and author searches the symbol # may be used to search for all words that match the preceding characters. For example, "title classical stud#" will locate titles containing the word classical and the word study or studies or studied or studying, or any other word beginning with the same four characters. The # sign must be preceded by a minimum of three contiguous characters. There is no provision for truncating suffixes to search for a series of common stems. That is, one cannot enter a search to find all "isms". A brief users guide card was prepared that summarizes commands and gives a sample session. This guide is in Appendix 6.5.

In both title and author searches the string (title words or author name) being searched for must be enclosed in quotation marks when the phrase being searched contains a "reserved word" (such as title, author, or date) that is not intended to trigger parsing action. For instance, a searcher might wish to seek the author named "John Title," or the title, "Carbon Date."

The syntax of this query language, as specified above, has the properties of a simple precedence grammar defined by Wirth and Weber <31>. It is parsed in a one-pass, left-to-right scan with a single push-down stack. A PL/1 program was developed to analyze the syntax (to make sure it has the simple precedence properties) and to parse the input of queries in such a language. This system, called SARPSIS (Syntax Analyzer, Parser, and Semantic Interpretation System), is primarily a consolidation of the work of Wirth and Weber and a translation of this work into PL/1. One advantage of having such a generalized syntax analyzer and parser is that it is relatively simple to change the query language.

Complete documentation of SARPSIS, including listing of the PL/1 program, is contained in the BALLOTS quarterly report for the period ending June 26, 1969 <2>.

A typical method of operation is to alternate between the search and output options. A search sequence results in a set of accumulated references, after which it is desirable to see the contents of the located references. The user chooses the output option by issuing either of the following commands:

```
type
print
```

When the user issues a "type" or "print" command, the system transmits to the appropriate device the contents of the accumulated items. The results may be presented on the IBM 2741 typewriter terminal or on an off-line printer.

There are two basic formats for text presentation. The primary format includes data for six of the data elements contained in a bibliographic item. These elements are:

Author
Title
Affiliation
Document Identification Number
Number of pages
Imprint date

The second format includes data for the same six data elements plus all others contained in the item. The user selects the second format by issuing either of the commands:

```
type extended
print extended
```

The user may preselect any combination of data elements to suit his convenience or the requirements of a given task. This is accomplished by issuing the "choose elements" command. All subsequent output is formulated according to this designated format until the user indicates that he is ready to go back to the default format or to specify another combination of data elements.

There is also a command to the system with which a user can state problems he is having or make suggestions for improvement. These statements are collected in a data set and printed out to the programming staff each week. This is one way in which the user becomes involved in the design of the system.

2.9.3 An interactive search session

Sample Searching Arguments using BALLOTS I Files

```
COMMAND? spires
*Welcome to SPIRES
SEARCH? yes
SUPPLY DATA COLLECTION NAME, D-C-N?  ipf
FIND?  title intimate
TITLE WORD SEARCH FOR... INTIMATE
        3 DOCUMENT(S) ACCUMULATED
? ti enemy
TITLE WORD SEARCH FOR... ENEMY
        1 DOCUMENT(S) ACCUMULATED
? type extended
```

```
ID:                 2977-2
AUTHOR:             Bach, George Robert, 1914-   Wyden, Peter, joint
                    author
TITLE:              The intimate enemy; how to fight fair in love and
                    marriage
PLACE/PUBLISHER: New York; Morrow
DATE:               1969 ...

OPTION?  restart
FIND? a george bach and a peter wyden and ti intimate and @
? ti marriage and date after june 1968
AUTHOR SEARCH FOR... GEORGE BACH
AUTHOR SEARCH FOR... PETER WYDEN
TITLE WORD SEARCH FOR... INTIMATE
TITLE WORD SEARCH FOR... MARRIAGE
DATE SEARCH FOR... AFTER JULY 1, 1968
         1 DOCUMENT(S) ACCUMULATED
? choose elements
ELEMENTS? title, author
ELEMENTS? date
ELEMENTS?
TO USE THIS FORMAT ENTER: TYPE OWN

? type own
TI    The intimate enemy; how to fight fair in love and marriage.
A     Bach, George Robert, 1914-  Wyden, Peter, joint author
D     1969

OPTION?  restart
FIND?  id 2977-2
ID SEARCH FOR... 2977-2
         1 DOCUMENT(S) ACCUMULATED
? type standard

ID      2977-2
A       Bach, George Robert, 1914-  Wyden, Peter, joint author
TI      The intimate enemy; how to fight fair in love and marriage.
ED      1st
PP      New York; Morrow
D       1969
ME      a
VID     30
PRO     po
ORD     1c
MRI     1c; 9-20-70
SHE     Meyer
PR      $6.95
PRE     1

OPTION? restart
FIND?  a may
```

```
AUTHOR SEARCH FOR... MAY
        2 DOCUMENT(S) ACCUMULATED
?d before 1920
DATE SEARCH THRU 1919
        0 DOCUMENT(S) ACCUMULATED
BACKUP? yes
SEARCH RESULTS RESET TO LAST             2 DOCUMENTS
?d from 1919 thru 1967
DATE SEARCH FROM JAN-1-1919 THRU 1967
        1 DOCUMENT(S) ACCUMULATED
? type own

TI      Spectroscopic tricks.
A       May, Leopold, comp.
D       1968
```

2.10 Prototype System Operation

Input operations under the BALLOTS prototype system began in late February 1969, after a three-month experimental period spent in designing, appraising, and adjusting.

The first task had been to establish the scope of the operations --i.e., the size and nature of the data base to be input. The character-set limitations of the IBM 2741 and the decision against trying to represent non-roman graphics automatically limited the data base to material that was already in the roman alphabet or that was customarily and regularly transliterated into the roman alphabet. It had been determined that approximately 30 percent of the Order Division's daily throughput of book requests could easily be accommodated, and this amount of material became the BALLOTS daily work load. The material included all science approval and purchase order material, all new standing orders, and a large segment of purchase orders going to Richard Abel and Co., Inc.

The ability to create, from original input material, the data to be converted into organized record and index files depended on the success of several other tasks. (1) Ninety-seven data elements had been defined (see the Data element Handbook in Appendix 6.6). (2) Tags for the data elements had been defined. (3) A standard method of encoding material had been worked out. (4) Procedures for input had been defined. (5) A machine-controlled editing routine had been designed. (6) A humanly managed editing routine--i.e., proofreading--had also been designed. (7) Finally, encoders and terminal operators were trained.

Library processing under the prototype system included data coding, on-line input, file building and maintenance, batch processing, statistics keeping, and report generation. It seemed essential that all these activities be centralized in the library to maintain uniform procedures and control the flow of paper. For this purpose, two new library units were created in the Automation Department: Data Preparation and Data Control. The Data Control Unit was organized before the prototype implementation, having been established in advance to test BALLOTS data elements, forms, input procedures, and training methods. A file of 200 acquisition records had been built and used to test the data-base building and retrieval programs. The Data Preparation Unit evolved as a separate, well-defined activity as a result of the experience gained.

2.10.1 Staffing and communication

Specific production functions were identified and scheduled for the personnel borrowed from the acquisition and catalog departments. Response was at first gratifyingly enthusiastic. However, after six to eight weeks, supervisory staff in the contributing departments began to express some concern over employees' loss of time for their own tasks. This problem was alleviated to some extent by an agreement that the Automation Department would provide from its own budget for one full-time employee in each contributing Department to compensate for lost time. This was a good idea that did not work because of three other problems:

1. Rating Employees - Rating the performance of contributed staff became a problem, as not all supervisors were willing to have their employees rated by someone else. The problem became acute in the case of one or two employees who performed much better as terminal operators or coders than they did as clerical assistants in their own Departments.

2. Staff Loyalty - Divided loyalties interfered with the efficient management of employees' time and effort. When there were peak loads in the manual system, a "contributing" employee would often be withdrawn from his scheduled commitment to BALLOTS.

3. Communication - Because people were borrowed from other Divisions, it was difficult to take more than 25 percent of any one person's time. Therefore, a greater number of people had to be involved. This in turn increased the amount of training and made communication about changes in the system that much more difficult. This was a real problem, since the procedures in Data Control and Data Preparation were experimental and subject to frequent change and improvement.

Not all problems centered about operations personnel. Communication with the Order Division on procedures to be followed in the prototype system was not satisfactory at the beginning. Many procedures were communicated orally at first; those communicated by memo were sometimes not sent to the appropriate people and confusion resulted. The production environment in the Order Division caused this confusion. Often supervisors were unavailable and communications were made directly to the employees, whose automation work the supervisors were to review. To alleviate the problem, policy decisions and procedures were documented in the form of Library System Notes, which were kept in a BALLOTS Data Control/Data Preparation Reference Manual in the Order Division. This material was available to supervisors and employees.

2.10.2 Training and text editor use

All the personnel contributed by other departments were called Technical Processing Assistants, a Stanford classification for beginning clerical staff receiving on-the-job training in bibliographic processes. Those from the Order Division were involved in pre-order acquisition and bibliographic searching. Those from the Catalog Department were involved in bibliographic searching, added-copies work, or typing headings on cards. Each employee in Data Preparation was trained in BALLOTS data element conventions, the flow of material into Data Preparation, vendor identification-number procedures, and the design of the coding sheet. Each employee in Data Control received training in Data Control procedures, the use of WYLBUR, data element mnemonics, interpretation of the coding sheet, proofreading techniques, and the flow of material into Data Control. Each operator trained in these areas was able to perform the job assigned. Those coders and input operators who were already familiar with Library of Congress bibliographic data had an edge over the rest and therefore were better able to resolve problems.

A typical WYLBUR session begins with a sign-on, a combination of prompts from the system and responses by the user. The main purpose of the sign-on is to put the user on-line, identify him to the system and to other users, and to facilitate the accounting of resource use. Following is a typical sign-on dialog; system response is always in upper case and the user customarily responds in lower case, though he may respond in upper case.

```
STANFORD  3  05/14/70 09:34:56
NAME?  harrison
ACCOUNT? XXX
KEYWORD? XXX
TERMINAL? w29
COMMAND?
```

The number following the word STANFORD identifies the communication line or "port" selected by the system for this particular terminal during this terminal session. This number is followed by the date and the time. The port number and the terminal identification number enable users to communicate with other active terminals in the system. The space to be occupied by the user's account number and keyword is automatically overwritten before this information is typed, to discourage account poaching by unauthorized users.

Users accustomed to terminal operations usually act to shorten the system command prompt as soon as sign-on has been completed:

```
COMMAND? set terse
?
```

Thus all later "prompts" are in the form of a simple "?." At this point WYLBUR may be used for the following functions:

1. Keying new data
2. CHANGING data in previously keyed lines
3. DELETING collected data
4. SAVING collected data in a named data set
5. USING previously defined data sets
6. RUNNING programs stored under data set names
7. PRINTING edited listings either at the 2741 terminal itself or offline on a high-speed printer.
8. LISTING lines containing specified strings of characters.
9. ACTIVATING the BALLOTS/SPIRES on-line, interactive search facility.

A case option permits input and output to be in upper and lower case. A WYLBUR session is terminated by the LOGOFF command. Upon sign-off, the user is furnished an accounting of his use of the following system resources or facilities: editing (CPU) time, compute time, memory usage (in page-seconds), I/O activity. Elapsed time is also given.

Numerous other functions, such as simple arithmetic calculation, can be performed, but the entire capabilities of WYLBUR are beyond the scope of this report. WYLBUR is completely described in the WYLBUR Reference Manual <32>. Using WYLBUR to input bibliographic records is described in detail in subsection 2.10.4.

The following definitions were used for Data Control and Data Preparation:

Coding - the preparation of data for input. This included assigning BALLOTS data element mnemonics to data to be input and supplying vendor identification numbers.

Editing - checking the accuracy, completeness, and legibility of the coding.

Input - keying coded data into a machine-readable file on the IBM 2741 terminal, using WYLBUR.

Proofreading - comparing a computer-produced printout against original coding sheets in order to note errors introduced during input.

Correction - using WYLBUR to correct input errors before incorporating the record into the In Process File.

Besides coding and editing, Data Preparation responsibilities included maintaining a machine-readable vendor name and address file used by the output printing programs. In addition to input, proofreading, and correction, Data Control was responsible for managing all acquisition file activities. This included running the SPIRES/ BALLOTS Data Base Building Program on a scheduled basis (using the Remote Job Entry facility of WYLBUR) and initiating the Purchase Order Output Print Program. File security was established by processing all In Process File updates in Data Control Department.

2.10.3 Input procedures

Input documents for encoding originated from two sources: material for which Library of Congress cataloging copy was available, and material for which no Library of Congress bibliographic data could be found. In the former case, a copy of the Library of Congress card was photocopied onto a blank coding sheet; in the latter case, a copy of the Library's standard book requisition form, SUL-25, was photocopied. This activity was performed by the Order Division secretary each morning. An average of thirty minutes per day were spent in this activity. The photocopied coding sheets were sent to Data Preparation for coding and editing.

Because of the large number of data elements, it was decided not to impose on the input operators the task of memorizing the tag for each data element. Nor were the data preparation staff asked to fill out grid forms to lay out precisely the content of a Data Element opposite its name. The use of grid forms was felt to be an unnecessary constraint. The fact that coding was being done without grid sheets for the Meyer Undergraduate Library book catalog keypunching was further evidence that the sheets would be unnecessary in the environment of the more flexible on-line terminal.

Input coding sheets arrived at the Data Preparation Unit by 9:00 a.m. daily. In the life of a record, this was Day 1. Each piece of information was tagged with a data element mnemonic. The coding sheet was divided into three areas:

Area 1: Preprinted Data Element Mnemonics
Area 2: Request slip (form SUL-25) box and
preprinted mnemonics
Area 3: LC card box and blanks for mnemonics

In Area 1, preprinted mnemonics were checked if applicable and coded values supplied if necessary. In Areas 2 and 3, lines were drawn from a mnemonic to the data on the SUL-25 Request Slip, proofslip, or LC card as needed. (Examples of a blank and a completed BALLOTS input coding sheet are shown in Figures 10 and 11. It quickly became apparent that the procedure of drawing in lines from the mnemonics to the data was not needed. After one week of inputting, most terminal operators were sufficiently familiar with the mnemonics and the data to interpret the coding sheet without the lines, and their use was soon discontinued.

Any Library of Congress bibliographic data was coded by a coder from the Catalog Department, whose knowledge of such bibliographic data facilitated the operation. When an entire coding sheet was finished, the work was reviewed, usually by the Data Preparation Supervisor. Coding and editing times were recorded on each coding sheet. Whichever library division had produced the data on the coding sheet was responsible for the accuracy of that data. Suspected errors found by Data Preparation coders were discussed with the Chief Bibliographer or the Head of the Order Division; Data Preparation did not have the authority to change original data. Detailed Data Preparation procedures are given in Appendix 6.5.

Included in the coding process was the assignment of vendor identification numbers. As mentioned above, Data Preparation was responsible for maintaining a master machine-readable file of vendor identification numbers, names, and addresses. Where possible, the vendor number used in the library manual system was used. Where no number existed, a number was assigned. This file was used by the Acquisition Print Program. Following this process for each vendor became burdensome; the procedure was changed so that only the 68 most frequently used vendors were assigned identification numbers, but the modified file still had to be maintained for change of address, etc. Appendix 6.5 contains an outline of procedures for modifying the vendor address file.

Edited Input Coding Sheets, arranged in identification number sequence, were sent to Data Control by 5 p.m. of Day 1 For input, proofreading, and incorporation into the In Process File.

CONTROL

BEGIN:

PR

CN

R

PAC

PO

BNI

CL

DE

ADD

STA

LN

ORD/MRI

IVP

Biblio.Descript.

TY

FRM

CNT

C

L

TR

GOV

X

D

XT

PR

ID

CF, CA , A

T

ED

PP

D

PR

BAC

SHE

LC CARD

VSP

RT

PUX

SSI, SPO

RID, IMP

RN

RAD

VCT

VID

FD - END

HOL: Holdings Data

Location	Copy Number	Volumes	Call Number	Variation	Status/Date
Hol: ;	;	;	;	;	
Hol: ;	;	;	;	;	
Hol: ;	;	;	;	;	
Hol: ;	;	;	;	;	
Hol: ;	;	;	;	;	

HN:

Additional information:

Figure 10

BALLOTS Input Coding Sheet

	Initials	Date
Coder:		
Editor:		
Term. Op.:		
Proof:		

CONTROL

IN:

PRO a

PRI

DES

MRI LC; 3-24-69

io.Descript.

ID
CF.CA A
T
ED
PP
D
PR
SHE

CLASS NO.
ID-10067
Engin.
NWC 001

07
AUTHOR
Deutsch, Ralph.

C-0
0-0 S-0
TII-0

INVOICE NO. SF
148153
L. C. NO.
69-13577

TITLE
System analysis techniques.
(Prentice-Hall electrical engineering
series)
Q A?N D6

ORDER NO.	PUBLISHER	PUB. DATE	REQUESTOR
801500	Prentice Hall	1969	JUS

ORDER DATE	EDITION	VOLS.	COPIES		APPROVED
			1		

DATE RECEIVED	INVOICE DATE		FUND
MAR 19 1969	02-21-69		30

RICHARD ABEL & CO., INC.
INDUSTRIAL CENTER BLDG.
GATE 5, ROAD MARINSHIP
SAUSALITO, CALIF. 94965

LIST PRICE	NET PRICE	SALES TAX	SELLING PRICE
13.50-1	12.15	.61	12.76

ORIGINAL INVOICE

ENGIN.

me-a

VSP

RT

PUX

SSI SPC

RID , IMP

RN

VCT

VID

HOL: Holdings Data

	Call Number	Location	Copy Number	Status
Hol:				
Hol:				
Hol:				
Hol:				
Hol:				

RN:

FD - END

Additional information:

Figure 11

BALLOTS Input Coding Sheet

	Initials	Date	Time Start	Time End
Acq.coding:	MW	3-24-69	10:17	10:18
Coder:				
Editor:				
Term. Op.:	CF	3-25	11:10	11:11
Proof:	P	3-25	½ min	

Each process slip carried a unique identification number and was flagged in the Order File to indicate that the item was being processed through BALLOTS. The identification number of an In Process File record for which Library of Congress bibliographic data was input was included on the item's catalog card to note the existence of a machine-readable record. All subsequent activity against an item in the In Process File was reported to Data Control for file updating. On the morning of Day 2, Data Control input operators began to key coding sheets.

2.10.4 Data input and update

In using the IBM 2741 terminal and WYLBUR, the following conventions were observed:

(1) The first line of each record must be the character string

BEGIN

BEGIN is preprinted on each coding sheet.

(2) The last line of each record must be the character string

END

END is preprinted on each coding sheet.

(3) The second line of data must be the identification number. The number is written on the source document xeroxed onto the coding sheet.

(4) Only one data element is permitted on each line.

(5) The input sequence must be:

Down Area 1
Down the first column of Area 2
Down the second column of Area 2
Down the first column of Area 3
Down the second column of Area 3

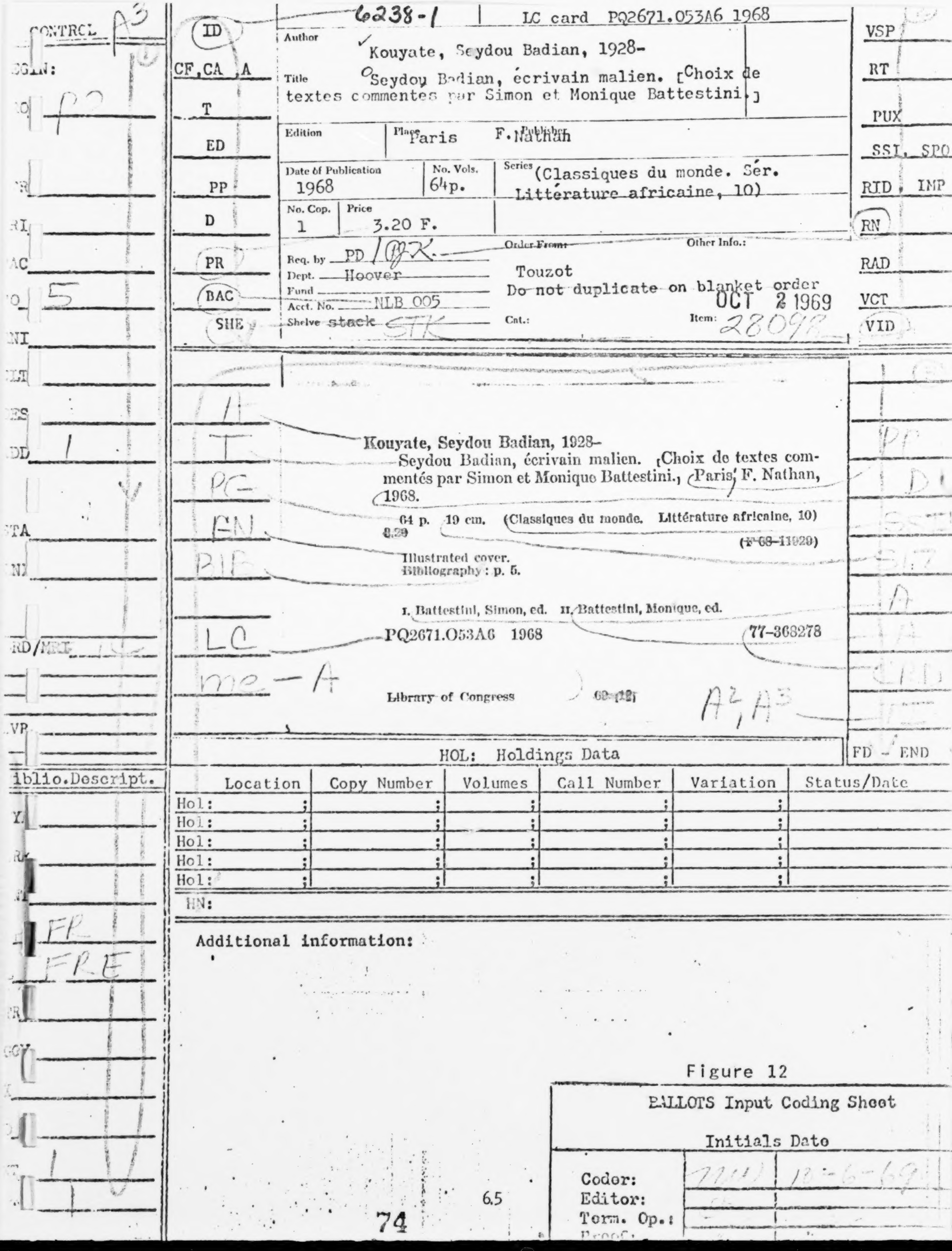
An input coding sheet marked with the proper input flow is shown in Figure 12.

(6) Data must be input in the form

<Data Element Mnemonic>"<Value of Data Element>"

For example:

a"Gilmartin, Nelson W."



CONTROL A3

EGIN:

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RI

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O 5

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ES

DD 1

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iblio.Descript.

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ID 6238-1

LC card PQ2671.053A6 1968

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Additional information:

Figure 12

BALLOTS Input Coding Sheet

	Initials	Date
Coder:	MW	10-6-69
Editor:		
Term. Op.:		
Proof:		

```
ID"300-6"
BAC"NKW300"
```

The use of quotation marks is a convention required by the build program. Sample records in input format are shown in Figure 13.

(7) Mnemonics are keyed only for the data elements actually used in the record. Data elements not used are not indicated.

(8) The WYLBUR default line length of 72 characters is used. If a data element exceeds one line, the quotation mark is omitted from the end of the first line. After a carriage return, the rest of the data is input beginning in character position 1, until all data is input. The last character is the double quotation mark.

(9) Data is keyed in upper and lower case using the WYLBUR upper-lower case option.

Each terminal operator saved a day's input in a WYLBUR data set on the IBM 2314 disc; each saved data set was named according to the convention:

BALLOTS.<operator initials>.<date>

At the end of the input session, each operator listed out the data at the terminal for proofing. A proofreader (different from the input operator) proofread this listing against the original coding sheet, noting errors. After proofreading, the data set was corrected using WYLBUR.

At the end of Day 2, the Data Control Supervisor strung the daily WYLBUR data sets together into a master data set, named

BALLOTS.FINAL.<date>.

The daily working data sets were then scratched.

The master data set was converted to a format that could be searched at a terminal. This was done by submitting it to the data base build program. Records successfully processed by the program were added to the data base along with changes to the associated entries in the index files. Records not successfully processed were handled by the correction routine described below.

It may well be asked why records are not input in a format immediately useful for machine searching. This question

```
 1.     begin
 2.     id"5685-1"
 3.     pro"po"
 4.     add"1"
 5.     ord"1c"
 6.     a"Shepard, Thomas, 1605-1649."
 7.     t"Three Valuable Pieces.  Viz.  Select cases resolved;
 8.     First principles of the oracles of God; or, Sum of
 9.     Christian Religion;##Both corrected by four several
10.     editions: and a private diary; containing meditations
11.     and experiences never before published."
12.     ed"Reprint"
13.     pp"New York; Garrett"
14.     d"1968"
15.     pr"$7.50"
16.     bac"NKC001"
17.     she"stk"
18.     me"a"
19.     rt"By Thomas Shepard##with some account of the Rev.
20.     Author..."
21.     ssi"(American Literature and Culture 1620-1820)"
22.     imp"<Boston: Printed and sold by Rogers and Fowle
23.     in Queenstreet, 1747>"
24.     vid"30"
25.     fd"10-6-69"
26.     end
27.     begin
28.     id"6042-1"
29.     pro"po"
30.     add"1"
31.     ord"1c"
32.     a"Rosenburg, Robert Kemper, 1920-"
33.     t"Choruses for Morning; Poems."
34.     pp"Baltimore; Linden Press"
35.     d"#1969"
36.     pr"$2.75"
37.     bac"NKC001"
38.     she"stk"
39.     me"a"
40.     rn"F.Lynden"
41.     vid"30"
42.     fd"10-6-69"
43.     end
?
```

Figure 13
Sample Records in Input Format

is often asked about the MARC Distribution Service, whose tapes are issued in a "communications format" that must be locally reprocessed for further use. The answer lies in the complexity of on-line search and retrieval software, which requires data to be expanded (or possibly even compacted) in ways too complex for human beings to transform and keyboard the data efficiently. It is simply more efficient to make the input operation as linear and perfectly straightforward as possible, and to assign to the computer all reprocessing and reformatting responsibilities. Transforming unprocessed bibliographic records via WYLBUR into searchable files is one of the largest and most complex programs in the BALLOTS system, for it simultaneously updates the master data base and creates the index files necessary for on-line searching. (The structure of these files is outlined in subsections 2.7.3 and 2.7.4.) Figure 14 shows the data sets used in prototype input and update operations.

WYLBUR data sets exist in three formats: edit, card, and print. Every line of a WYLBUR data set in edit format is assigned a unique line number. At a normal terminal session, the edit format is always in use for collecting and modifying the data set. However, to change a WYLBUR data set into a BALLOTS I data set, capable of being processed by the data base BUILD program, it was necessary to change the edit format to the card format--a format in which line numbers are stripped off and the data stored as if it were a series of eighty-column card images. This is done with a single command to save the data set in card format. A card format master data set was created and the master data set in edit format was used as a back-up. Both were saved on different disk volumes under data set names

BALLOTS.FINAL.<date>

After a completely successful data base build run, the card format data set was scratched and a period was added to the edit format data set name to indicate that those records had been successfully built into the In Process File, thus:

BALLOTS.FINAL.<date>.

Data Base Build and Tape Dump programs were set up by the Data Control Supervisor. Using an automatic job control language (JCL) generator that prompted the user with a series of consecutive questions, the Supervisor specified the programs and files to be used, the appropriate run time, and the data sets to be input to the build program. The JCL generator provided a simplified way of setting up program runs, and allowed the system programmers to make JCL changes easily. A description of the automatic job control language generator, excerpted from the BALLOTS Third Quarter 1969 Progress Report to the Office of Education, is given in Appendix 6.5.

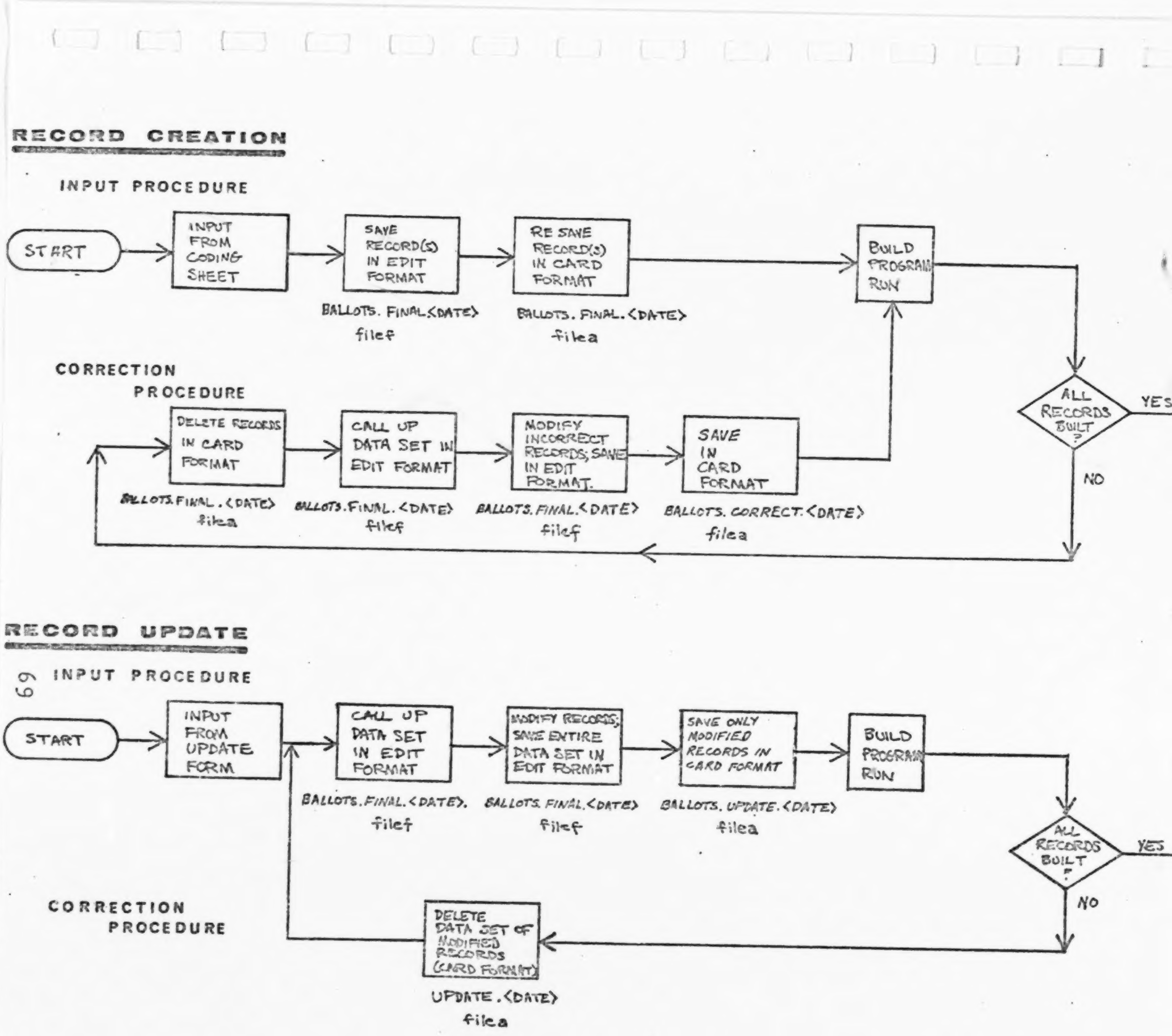
RECORD CREATION
INPUT PROCEDURE
START
INPUT FROM CODING SHEET
SAVE RECORD(S) IN EDIT FORMAT
BALLOTS. FINAL.<DATE> filef
RE SAVE RECORD(S) IN CARD FORMAT
BALLOTS. FINAL. <DATE> filea
BUILD PROGRAM RUN
ALL RECORDS BUILT ?
YES
NO
CORRECTION PROCEDURE
DELETE RECORDS IN CARD FORMAT
BALLOTS. FINAL. <DATE> filea
CALL UP DATA SET IN EDIT FORMAT
BALLOTS. FINAL. <DATE> filef
MODIFY INCORRECT RECORDS; SAVE IN EDIT FORMAT.
BALLOTS. FINAL. <DATE> filef
SAVE IN CARD FORMAT
BALLOTS. CORRECT. <DATE> filea
RECORD UPDATE
INPUT PROCEDURE
START
INPUT FROM UPDATE FORM
CALL UP DATA SET IN EDIT FORMAT
BALLOTS. FINAL. <DATE>. filef
MODIFY RECORDS; SAVE ENTIRE DATA SET IN EDIT FORMAT
BALLOTS. FINAL. <DATE> filef
SAVE ONLY MODIFIED RECORDS IN CARD FORMAT
BALLOTS. UPDATE. <DATE> filea
BUILD PROGRAM RUN
ALL RECORDS BUILT ?
YES
NO
CORRECTION PROCEDURE
DELETE DATA SET OF MODIFIED RECORDS (CARD FORMAT)
UPDATE. <DATE> filea

Figure 14
Data Sets used for Input and Update

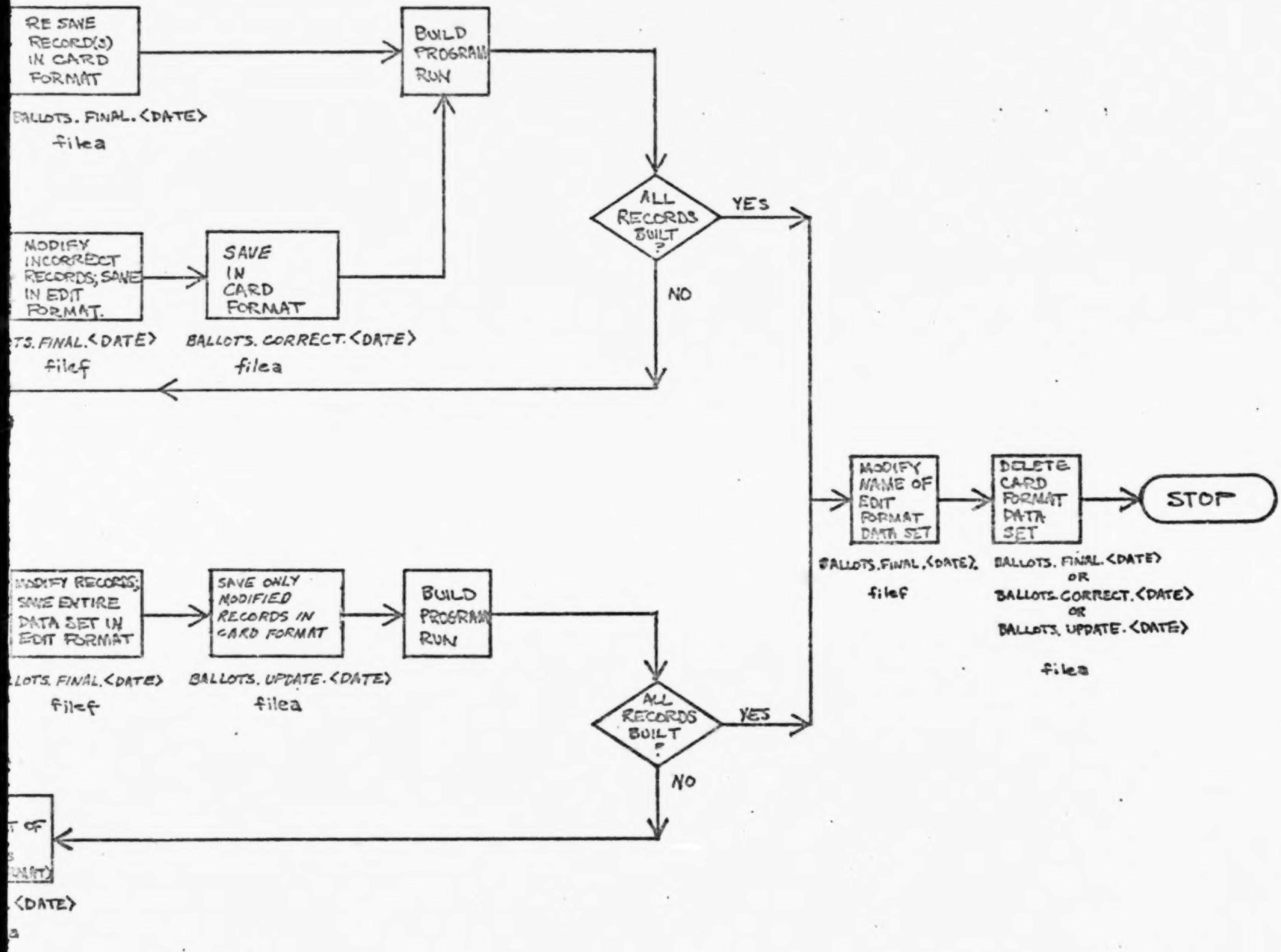
RE SAVE RECORD(S) IN CARD FORMAT
BALLOTS. FINAL. <DATE>
filea
BUILD PROGRAM RUN
MODIFY INCORRECT RECORDS; SAVE IN EDIT FORMAT.
TS. FINAL. <DATE>
filef
SAVE IN CARD FORMAT
BALLOTS. CORRECT. <DATE>
filea
ALL RECORDS BUILT ?
YES
NO
MODIFY NAME OF EDIT FORMAT DATA SET
BALLOTS. FINAL. <DATE>.
filef
DELETE CARD FORMAT DATA SET
BALLOTS. FINAL. <DATE>
OR
BALLOTS. CORRECT. <DATE>
OR
BALLOTS. UPDATE. <DATE>
filea
STOP
MODIFY RECORDS; SAVE ENTIRE DATA SET IN EDIT FORMAT
LLOTS. FINAL. <DATE>
filef
SAVE ONLY MODIFIED RECORDS IN CARD FORMAT
BALLOTS. UPDATE. <DATE>
filea
BUILD PROGRAM RUN
ALL RECORDS BUILT ?
YES
NO
T OF
S
RMAT)
. <DATE>
a

Figure 14
Data Sets used for Input and Update

The Data Base Build Program was run overnight. After every sixty minutes of build time, the entire In Process File and its indexes were dumped onto tape as a back-up. Two tapes were used: one for every odd dump; the other for every even dump. This provided additional back-up in case of error or disk file destruction. The results of the build program were printed out and sent to the Data Control Supervisor. Records successfully added to the In Process File were listed. Records that contained errors were listed with a diagnostic message explaining the errors. (See Appendix 6.5 for a list of diagnostic error messages.)

Data Control verified the nature of each error using these diagnostic error messages. The corresponding record in the edit format master data set was corrected. A card format data set of corrected records was created and named

BALLOTS.CORRECT.<date>

This data set was run through the Data Base Build Program along with new master data sets in the next run. When corrected records had been successfully incorporated into the In Process File, the card format data set of corrections was scratched. Records still in error were run through the same process until accepted into the In Process File.

As for update, new or changed information on items with In Process File records were noted in the Acquisition and Catalog Departments on either the Acquisition/Catalog Update Report form or the Cancellation Information Sheet. (Examples of these forms are included in Appendix 6.5.) These forms were collected daily by the Data Preparation Supervisor and reviewed for legibility and completeness. They were sent to Data Control on the same day, arranged in identification-number sequence.

The update program available during the prototype operation was on the entry level only. That is, to update a record in the In Process File, it was necessary first to delete the record in the In Process File and then to substitute an updated record in its place. To do this, the record was first located in one of the master data sets in edit format by using the data set indexes described below. The record was modified using WYLBUR. All records modified in a day were copied to a card format data set named

BALLOTS.UPDATE.<date>

Preceding the records in the data set was a series of commands to delete the old record in the In Process File. These update data sets were included in the next Data Base Build Program, and were run along with new master and correction data sets. If an error in the updated record prevented its being built into the file, the correction routine described above was followed. After a completely successful build run, the update data set in card format was scratched. A period was added to the end of the data set in edit format to indicate that the records in the data set had been successfully added to the In Process File, thus:

BALLOTS.UPDATE.<date>.

The source documents for update reports and cancellations were filed in identification-number sequence with the original Input Coding Sheet.

The failure to develop an economical and rapidly executing update program at the data element level was a serious shortcoming of the BALLOTS I system. A consequence of this was the necessity of deleting an entire record and replacing it with a new record, which had to go through the whole routine of the Data Base Build Program just as if it were a newly added record. Numerous attempts were made to achieve update at the data element level, but all foundered on the complexity of the Data Base Build Program.

The use of WYLBUR for updating was more expensive than originally anticipated. All input data sets that went through the Data Base Build Program were saved, in order to process subsequent updates. This resulted in a large number of master data sets. An index to all the master data sets was constructed, giving the data set name and line number for every record identification number that had been built into the In Process File. This index was created by a BALLOTS-developed program from all existing master data sets. Using WYLBUR, the operator would bring the index into core storage and give the command to scan the list for the ID number of the record to be updated. The command to scan in this way was:

```
list '<identification number>' in all
```

When the item was found, the data set name and line number of the record was printed out for the operator to see. The operator did this for each record to be updated and then proceeded with the updates. Scanning took a substantial number of machine cycles and was billed as "editing time" at the established rate for CPU time, $9.00 per minute.

A less costly method was devised after several weeks' experience with the system. By running the index through an IBM sort-merge utility program, a printed list in identification number sequence was produced. This program was run initially to sort the existing index entries and was later used to merge, in sequence, any entries added to the index.

In summary, the WYLBUR data sets created in Data Control were:

	Informal Data Set Name	Formal Data Set Name	Name of volume where data set was stored on IBM 2314
1.	Master Data Set	BALLOTS.FINAL.<Date>	FILEA
	Card numbered format. This data set was used as input to the Data Base Build Program. After a completely successful build run, this data set was scratched.		
2.	Master Data Set--Back-up	BALLOTS.FINAL.<Date>	FILEF
	Edit format. This data set was used as back-up and for all correction and update activities. The name was changed to BALLOTS.FINAL.<Date>. after all records were successfully processed by the Build program.		
3.	Daily Working Data Set	BALLOTS.<Operator's initials>.<Date>	FILEG
	Edit format, no back-up. Each input operator created a daily working data set for each day's input. After all daily data sets were concatenated into the master data set, each daily data set was scratched.		
4.	Data Base Correction Data Set	BALLOTS.CORRECT.<Date>	FILEA
	Card numbered format. Created as needed. Scratched after all records successfully incorporated into In Process File.		
5.	Data Base Update Data Set	BALLOTS.UPDATE.<Date>	FILEA
	Card numbered format. Created as needed. Scratched after all records successfully deleted and added to In Process File.		

The prototype system was activated in February 1969 and terminated in October of that year. By the end of the prototype implementation, over 6,000 records were being maintained in over 100 WYLBUR master data sets in edit format.

2.10.5 Printed Output

The major offline output in BALLOTS I was the universal bibliographic data form, which could be used as a purchase order, claim, cancellation, notification to requester, catalog data slip (i.e., work slip), or notice to the National Program for Acquisition and Cataloging (NPAC). Catalog cards were not produced in BALLOTS I; the lack of file integrity on the IBM 360/67 made this too much of a problem. Full particulars on the universal form and the programming for its production are contained in the BALLOTS Quarterly Report for the period ending June 26, 1969 <2>. Samples of the form appear in Appendix 6.5.

2.10.6 Statistics and evaluation

Of major interest in any new operations like Data Control and Data Preparation are the statistics collected on processing times, throughput volumes, and personnel performance. Collecting statistics was difficult, mainly because of the high turnover in borrowed staff and the lack of full-time supervision. These made training a seemingly never-ending task and a costly drain on the development staff's time. As a consequence, it was impossible to collect usable statistics in interesting areas such as:

1. Throughput times for update processing and proofreading.
2. Personnel time for functions such as data base building, file manipulation, or file back-up procedures, all of which were tasks performed by the WYLBUR remote job entry facility.
3. Throughput times for correcting daily WYLBUR data sets.

For a six-week sample period during May and June, 1969, the following production rates were tabulated:

A. Records with acquisition, control, and LC bibliographic data:

Function	No. Items	Time (min.)	Rate (min./item)
Coding	360	1,115	3.10
Editing	360	514	1.43
Input	360	1,821	5.06
TOTAL	360	3,450	9.59

B. Records with acquisition, control, and partial bibliographic data (i.e., no LC data):

Function	No. Items	Time (min.)	Rate (min./item)
Coding	427	817	1.91
Editing	427	377	.88
Input	427	848	1.99
TOTAL	427	2,042	4.78

The table shows, as might be expected, great differences in input rates between records having LC bibliographic data and those which did not. The average time to code, edit, and input a record with LC bibliographic data was a little more than twice the time needed for records with partial bibliographic data. Since the data element structure in BALLOTS I did not provide for subfield codes or delimiters, input times are not directly comparable with timings for MARC records given in the MARC Final Report <1>; however, input timings do appear to correspond with the experience of other libraries <14>.

As the Data Preparation and Data Control staffs gained experience, the average elapsed time for coding, editing, and keying both types of records declined and finally leveled off at 3.3 minutes per item. Total production during the final three months of prototype operations was as follows:

Month	Man-hours of direct labor	Records processed	Average time/record	Approximate annual production rate
August	51.1	839	3.6 min.	10,100
September	45	818	3.3 min.	9,800
October	63	1,144	3.3 min.	13,700

Note that these figures apply only to direct labor time for input; supervisory time has not been included. Supervisory time for each of the three months was, respectively, 168, 167, and 184 hours.

Establishing Data Preparation and Data Control units as a centralized function seems to be effective and essential where typewriter terminals are the input device. But typewriter terminals are far from ideal for inputting highly formatted records of varying lengths. We believe that errors and input time can be significantly reduced by using CRT terminals for input. (See also sections 2.8 and 3.4.)

Noise, speed, and display format were found to be the most important limiting factors. Noise (especially in output) was significant even when sound shields were used. Both operators and the people working nearby found it distracting. Typewriter terminals scattered throughout the library in a production system would pose a worse problem. The speed limitation had three aspects. First, the carriage return time on the typewriter terminal is too long. Second, the time involved in the printing of the line numbers and prompts furnished by the text-editing system is too long. Because it would be too time-consuming to let the system automatically prompt for all possible data elements, the operator would have to enter the mnemonic for each data element actually input. Programmed on-line editorial checks of input become virtually impossible owing to the time required to print out error messages. Third, the message length on the typewriter is not long enough: a maximum of 133 characters. A record keyed on the typewriter may involve many computer interruptions. (One keyed on a CRT terminal, which has a maximum message length of approximately 1,000 characters--one screen, would involve far fewer interruptions.) Finally, the inability of the typewriter terminal to provide formats would practically force the operator to work from a prepared coding sheet. A CRT terminal that can display to the operator a complete, formatted page, that can print at the rate of 1,000 words per minute (versus the 175 words per minute of the 2741 typewriter terminal), and that does so silently, is clearly a more desirable, people-oriented device.

When prototype operations ceased in October 1969, considerable attention was given to the problem of designing CRT screens suitable for bibliographic input. The first decision made was to provide screen format recognition and on-line validity checks. Thus the computer would "know" the data elements on a given screen and what processing rules apply to each data element. Each screen could be fully edited when transmitted and appropriate diagnostic and error messages returned. This arrangement, now under development in BALLOTS II, will provide several advantages: a high degree of machine assistance for the operator; the ability to scan visually an entire page of bibliographic data at one time; more rapid input than on the typewriter terminal; reduction of errors in the data base owing to built-in editorial and diagnostic procedures; and elimination of the centralized input operations, with a consequent reduction in supervisory overhead.

3.0 FINDINGS

This chapter records our findings based on the experience in library analysis, design, programming, and operation gained with the on-line prototype system. The word "findings" is often used in describing the results of a discrete, controlled research project. It suggests quantitative data and statistical correlations. Developing and introducing an on-line computer system in a traditional service agency, such as a library, within an established institution, such as a university, is a complex process that is not subject to precise experimental control. There are few if any guidelines, and those who undertake such an effort are working with a mass of human and organizational variables. We share the perspective of Overmyer's <20, p. 272> comprehensive library automation state-of-the-art review:

> This report also takes the position that the high cost of development has been of value. Planning, experimentation, testing, and evaluation are an unavoidable part of any carefully thought-out new endeavor. At some time and in some place these steps must be taken; if they are not, nothing but chaos and even greater expense are in sight. There has been waste and undoubtedly there has been a certain amount of "reinvention of the wheel" while automation in libraries has been getting underway; but much of this has been unavoidable. In the absence of guidelines and a body of knowledge to lend support, libraries have had to engage in "trial and error." Experimentation and the use of new techniques take longer than established procedures and inevitably increase costs. As communication improves and criteria are developed, hopefully more will be learned from the experience of others.

BALLOTS I findings result from the prototype operation and their limitations are primarily the limitations in the implementation of that prototype. They are not conclusive in most cases. Indeed it is our hope that they will evoke questions, criticisms, and ideas on how to do better. We have learned from our own experience and it is our expectation that the reader of this report will see things that are not clear to us.

3.1 Shared Facilities

A gross estimate of the cost of the total implementation effort breaks down as follows:

BALLOTS	1/3
SPIRES	1/3
SHARED FACILITIES	1/3

Shared facilities consist of software and hardware designed to provide concurrent service to functionally related applications. If each application user pays for his own development plus half of the shared facilities, he effectively gets the use of 67 percent of the system for half the total investment. Alternatively, if two users invest similar amounts in independent development efforts, each is given substantially less for his money. Hardware economy of scale also applies here. If two users pool their resources to acquire shared hardware, the resulting capability will be greater than would the capabilities of separate installations. This simple analysis argues for continuing combined development.

3.2 Economy and File Integrity

BALLOTS I has demonstrated the technical feasibility of computerized support for the bibliographic operations of the large library. Two constraints--one economic, the other technical--prevented the Stanford library from converting its prototype operations into a production system. These constraints stemmed from the nature of Stanford's IBM 360/67 service and the mission of the Campus Facility as defined in the period 1969-70.

Two sections of computer memory are available for program execution at the Campus Facility. The first (high-speed batch) is approximately 100,000 bytes in size and accepts jobs lasting up to two minutes. The second (production batch) is approximately 300,000 bytes in size and accepts jobs of any duration. The prototype system uses the latter. A disadvantage of this arrangement is that while any other program is executing in the larger portion of memory, BALLOTS cannot, and vice versa. (Under the configuration existing in 1969-70 this precluded production use of Stanford's 360/67 by the library.) The Campus Facility's policy in this environment is to discourage long jobs by charging more per execution minute as the job progresses on the 360/67. A pricing structure (see the rate chart for the 360/67, Appendix 6.2) has been established that rewards the person who submits a short, efficiently written and rapidly executing job and correspondingly penalizes jobs lacking such characteristics. A further discrimination is made between day and night jobs; it is cheaper to run at night. It is clear that these policies are not to the benefit of a resident on-line file system. The BALLOTS System is, in effect, a single job that runs the entire day. According to the government-approved flexible pricing agreement (see subsection 2.4.2), there was no way Stanford could "wholesale" computer time to the library. All users had to be charged the same rates for the same resources.

The problem is complicated by a lack of guaranteed access to the system from a terminal. There are over 200 terminals connected to the system; about eighty can be in use simultaneously. The 360/67 is currently approaching its capacity during periods of peak use. These periods occur near midterm and final examination time, or roughly eight times per year. During such intervals the execution backlog grows long, and it is difficult to gain access to the system through a terminal. If the library's functions were supported on-line all day, fifteen to twenty of the eighty terminals could be tied up constantly.

The technical constraint concerns file integrity. Stanford's software and procedures for its IBM 360/67 are directed toward a rapid throughput, computation-oriented market. Although the data processing facilities provided are of excellent quality, a higher priority is placed on keeping the computational facilities operative for the entire group of users than on maintaining the capability of full file recovery. If a file failure occurs, correction must wait until a scheduled software maintenance interval. On the average, the Campus Facility's 360/67 fails once every 36 hours, and sometimes more often. The incidence of failure may seem high to non-computing people, but realistically speaking, the system has excellent reliability for such a complex facility. Recovery from software failures is normally quite rapid--ten to fifteen minutes. (Hardware failures require more time to rectify and depend on the availability of parts and qualified service personnel.) Such failures, however, can cause unacceptable inconvenience to users of very large, continually updated library files.

The recovery of files whose integrity has been lost in such situations is accomplished by periodically copying the file to disk or magnetic tape (dumping) and recopying it back to the disk (restoring) following a failure. Any changes made to the file since the last dump are lost, however. It has proved practical to dump a file after each hour of actual file building. But on Stanford's 360/67, dumps must be initiated by the user; they are not built into the system software. Because of the vast number of user files (over 60,000) and the fact that only the users can distinguish important from unimportant data, no attempt is made to provide audit trails and logging tapes that could enable the system to re-establish its precise status at the time of a failure with no loss of data. For the scientific community using a large, time-sharing system, this is not a severe problem. If the system fails and a program or small file is destroyed, it can easily be reinput and reprocessed when the system is again operational. But for the BALLOTS files this is a different matter.

Considering all this, it seems clear that on-line bibliographic services should be provided in a computer environment that is intended for file-oriented applications, not just scientific computing. This is certainly true if production is being considered. However, the development work for library automation and information retrieval is exceedingly complex, and owing to the more ready availability of software talent in the large scientific center, it is believed that the system development work is more certain of success if conducted in the existing on-line scientific rather than an existing batch production environment. Oettinger <21, p. 126> has summarized the difficulties of performing development work on a computer intended mainly for administrative work:

> As many computer centers of all kinds have found out to their despair, routine scheduled administrative work and unpredictable experimental work coexist only very uneasily at best, and quite often to the serious detriment of both.

It is important to note that there is nothing in the 360/67 computer itself that precludes production operation. Adequate provision can be made in the software for file security, system reliability, and fast recovery. The operations environment can be production oriented. When this is accomplished, educational and research applications and production applications can coexist on the same configuration. The existing stock of peripheral equipment and system software must be modified, and cooperation is required between the library and the computer center. Use of the 360/67 for BALLOTS II production operation is now being worked out. It is expected that the necessary computing environment will be created to meet the library's production requirements.

3.3 Performance of On-Line Searching

In BALLOTS I, two groups of operators and three groups of material were chosen for a test of the efficacy of the on-line search facility. Of the six operators who participated in the test, the first group were two members of the Project Ballots staff and the second group were four members of technical processing departments. The groups of material to be searched were as follows:

GROUP A: Request slips for books known to be on record in the In Process File. The searchers were requested not to use the record identification number to perform these searches.

GROUP B: Unsearched request slips received in the Order Department the day before the searching experiment was conducted. The searchers had no assurance that corresponding records existed in the In Process File.

GROUP C: Unsearched, recently received approval books. Again, the searchers did not know whether corresponding records existed in the In Process File.

Each searcher's work was observed and the time taken to conduct each search was noted. In the tables below, each operator is identified by a number. An asterisk preceding the number indicates a member a member of the BALLOTS staff.

GROUP A SEARCHES

Day	Operator Number	Total Items Searched	Total Minutes Elapsed	Average Min. per Search
1	*1	16	36	2.25
	2	5	12	2.40
	3	3	25	8.34
	4	4	20	5.00
TOTAL		28	93	3.32
2	*1	34	63	1.85
	2	20	26	1.30
	3	12	21	1.75
	5	15	25	1.67
	*6	13	26	2.00
TOTAL		94	161	1.71
2-DAY TOTAL		122	254	2.08

GROUP B SEARCHES

1	2	18	14	.78
	3	24	17	.71
	4	21	16	.76
TOTAL		63	47	.75
2	2	26	31	1.19
	3	19	15	.78
	5	9	12	1.33
	*6	18	30	1.67
TOTAL		72	88	1.22
2-DAY TOTAL		135	135	1.00

GROUP C SEARCHES
(performed only on Day 2)

2	2	14	14	1.00
	3	11	14	1.27
	5	11	18	1.64
	*6	10	13	1.30
TOTAL		46	59	1.28

The overall totals, for all operators and all types of material, were:

Total items searched	303
Total elapsed minutes	448
Average minutes per search	1.48

The relatively long search times recorded on the first day were due to slow response time. This, in turn, was attributable to heavy demand on CPU cycles from all other partitions, all of which had priority for service. (The on-line search facility occupied the Production Batch of high-speed core. According to Stanford's IBM 360/67 scheduling algorithm, all other partitions except High-Speed Batch have prior call on CPU cycles. See subsection 2.4.2.)

Fortunately, this situation did not persist on the second day. The shortest search times were those of operator 1, who had the most experience in conducting demonstrations and had practiced on an almost daily basis. All the other searchers were part-time users.

3.4 Terminal Performance

Even under the best circumstances (little competition for CPU cycles), the performance of any search facility is unimpressive when it is dependent on a typewriter terminal (See section 2.8 and subsection 2.10.6). The experience of BALLOTS I demonstrates the limitations of typewriter terminals for on-line searches. It takes long enough to type out the number of references satisfying the inquirer's search arguments. Should the user commit a syntactic error in the construction of his search, he is fortunate to receive a diagnostic message pointing out his error, but still he receives this message at the cost of his valuable time; and he must then reinput a corrected search. The most frustrating and time-consuming part of a search session with a typewriter terminal is, of course, waiting for results to be printed at the terminal.

Noise is a further inconvenience. Faster mechanical devices are likely to be noiser and possibly less reliable, owing to the increased speed of the mechanical parts. Even the relatively cumbersome IBM 2260 is more than ten times faster in operation than the IBM 2741. We conclude that the use of typewriter terminals in any library production environment could never be entirely satisfactory. A fast and flexible video terminal would aid in meeting the goals of bibliographic operations in the library.

In this connection, it is useful to distinguish between the maximum character rate of a device and its useful throughput rate. The IBM 2741 typewriter terminal has a maximum character rate of 14.8 characters per second. Its throughput rate, work actually accomplished in a given unit of time, is considerably less because of carriage return time, the time taken to shift from lowercase to upper-case and back again, and the time required to set up a new line. (The CRT terminal can output from 300 to 1,200 characters per second, depending on the model and the transmission line capacity.) Many other human factors and man-machine factors further reduce system throughput--such as the need to align forms in the typewriter and the operator's possible absence from the terminal at the time a system prompt arrives. Although some of these factors are also present in CRT terminal use, removing the mechanical limitations greatly accelerates throughput.

3.5 Staff and Resource Commitment

The major components of institutional commitment to library automation have been reviewed and analyzed by Weber <29, 30> in two papers. A brief summary follows; the reader is referred to Weber's complete papers for further details.

In the beginning, it seemed very clear to the Stanford Library that the computer support staff and systems analysts had underestimated the difficulty of creating an on-line system to support the library's complex bibliographic operations. What was not clear at first was that the library itself had also underestimated the difficulty of the task, as much as had its computer colleagues.

Almost all the library functions depend on a complex combination of intellectual decisions and repetitive, clerical tasks. Librarians appreciated the conceptual complexity of their own professional tasks, but they had difficulty visualizing the depth of detail required to specify in full the tasks to be performed by the computer. This burden weighed most heavily on the professional library staff, many of whom were attempting for the first time to specify concisely and unambiguously the steps taken in bibliographic processing. It was the clerical and repetitive operations that were to receive computer assistance; this forced many librarians to immerse themselves in the dreary details of step-by-step descriptions of processes and functions, which would be handed over to the programming staff.

It was not easy to persuade some librarians that such detail was necessary; some were convinced that the mystical art of programming would fill in the gaps left in system description. Fortunately, the development staff was persistent and persuasive. Their tact and continued top-level support from the library administration made this difficult part of project development proceed with minimum dissension and maximum motivation. Our experience supports that of the report of the American Council of Learned Societies' Committee on Research Libraries <17, p. 65>:

> How can a good set of computer programs be created for libraries? They must be built up gradually by experimental development in an existing library. With focused objectives and effort, progress should be clear in a period of perhaps five years. Some programming experts must be brought into libraries but, more important, libraries must learn to use computers and must come to understand their strengths and limitations. This education process will take several years under the best conditions. From experience in other fields we can emphasize that there is no alternative to library experts learning computation. Any other course will lead to inferior results with great waste of money and effort.

Scheduling was another aspect of the system development process with which librarians were unfamiliar. Most technical processing librarians were familiar with the concept of the "event driven task." For librarians, the arrival of a book at a processing station, the work upon that book, and its departure to the next station were perfectly familiar events. But the professional staff did not associate any particular scheduling requirements with these events--books moved rapidly or slowly in accordance with their difficulty of processing. In the system development process, they were forced to survey many system components and mesh their own work assignments with those of many other persons. To do this effectively required the most detailed definition of tasks (this is what the Task Assignment Sheets were developed for) and the careful scheduling of tasks, so that procedures and processes could be developed on some realistic schedule. Most librarians required a period of intensive training and mental reorientation. Many persons soon got used to meeting deadlines, even if this meant working nights and weekends. After the initial shock of the reorientation, assignments were usually carried out with dispatch, and the librarians soon found themselves able to establish reasonably accurate task schedules and time estimates.

As project activity accelerated in the course of production system development, it became apparent that members of the library staff would have to be assigned to temporary duty on the project staff. It was difficult to convince department heads of the necessity for this, partly because of the persistent belief that the all-knowing computer and the system development staff could see to all the required details of system design (i.e., that a system could be designed for the user without the user's participation). Furthermore, it was even more apparent that the persons assigned would have to be senior librarians of the departments to be affected by automation. Only these persons would have the many years of bibliographic experience and the broad policy views necessary to distinguish the important from the unimportant in the actual details of system work. In the end, the persons chosen for this active participation included the Assistant Chief of the Catalog Division, several senior librarians, and the Administrative Assistant to the Assistant Director for Bibliographic Operations. Many other full-time librarians were drafted for the automation effort. The Director of the University Libraries regularly contributed about 15 percent of his time to BALLOTS. The involvement of all these people means that the BALLOTS system will be designed WITH its users--an essential characteristic if the new production system is to serve those users effectively.

The physical needs of a major development effort are not likely to be found in today's crowded libraries. Before the development staff moved to one location near the Computation Center, the library had provided three rooms, totaling some 1,600 square feet in space, in its main building (which had been erected in 1919). Extensive alterations were needed to make this space suitable for the development effort.

Essential to a software development effort is the staff's ability to maintain irregular hours--particularly because of the need to test and debug during off hours, when a system crash would not adversely affect other users of the Campus Facility's 360/67. Another need, hard to satisfy in the library building, is the demand for food and coffee, the latter almost being the programmer's life blood. Smoking is common among some programmers, and some will not take jobs where they cannot smoke. None of these requirements is readily met in any library environment. Additionally, the heavy use of on-line terminals in program development produces a noise level intolerable in the library without expensive acoustic treatment. There seems to be no way to avoid creating special work conditions conducive to maximum performance from a system development staff. This in itself may require a major adjustment to be made in the personnel policies and physical plant of the library.

3.6 Usefulness to Other Libraries

Large system development, especially when undertaken with federal funds, should be useful to as many libraries as possible; this is the transferability criterion that is a basis for funding grant proposals. Many specialists in library automation now recognize that transferability is a single term that masks a complex problem. Transferability refers not just to a whole system but to aspects of the system such as equipment, applications software, and procedures. It refers to the context within which the system was created; the design approach, for example, and management techniques. Transferability is a function of current computer technology and programming methods. It is also a function of library standardization and cooperation. It is our belief that the problem of transferability is complex enough and of great enough importance to warrant a separate research effort. The objective of this effort would be to pinpoint transferability characteristics and then to define factors associated with each of these characteristics that enhance or retard the likelihood of transferability.

This section is an attempt, based on the BALLOTS I experience, to begin such an analysis. An on-line library automation system is a complex of central computer equipment, input/display terminals, computer center operations procedures, systems software, applications software, library input, search and update procedures, and printed manuals. It is created by development techniques that include analysis, design, programming, and management. There are economic and manpower constraints in both development and operations. A system is developed and implemented within an existing library organization, (often) using an existing computer center. Such are, in general terms, the factors that affect the likelihood of transferring a library automation system in whole or in part from one library to another. For convenience we group these factors into five levels: the system development level, the organizational level, the equipment level, the software level, and the library operations level. These conceptual levels are not hierarchical; they tend rather to intersect and overlap. As each level is discussed, we will indicate the way in which BALLOTS I attempted to promote transferability and assess the extent of its success. Ways in which BALLOTS II is working to promote maximum transferability will also be discussed.

3.6.1 System development level

This level includes the techniques of analysis, design, programming, and implementation. It refers to substantive conceptual approaches as well as to ways of managing these activities. The factors that affect transferability are: the amount of implicit knowledge required by analysis tools (e.g. forms); the extent to which design work presents a solution without presenting a general characterization of the problem; the amount of documentation required and completed; the degree of informality in management procedures; the nature of task definition (for example, is definition general without the necessary detail being added later? or is it spelled out but without thought for the overall development plan?).

BALLOTS I system development methods were appropriate to prototype development but have limited use for other libraries. Analysis forms were developed but detailed standards (instructions) for their use were not created. Much of the problem statement in the design area remained in the personal notes of designers and in unrecorded staff discussions. Specific design solutions were written up, but rarely along with alternatives for consideration. Management techniques tended to be of the loose, flexible kind found in most research projects in a university situation. The difference between the effort that produces a research report and the effort that is required to produce an operating system was not recognized in day-by-day management techniques. This problem is not unique to BALLOTS. Its solution involves introducing some of the elements of management in business (which is directed toward developing profitable products and services) into the library and adapting them to the values of a non-profit service organization.

BALLOTS II at its inception produced a documented system development plan, a project management process for task definition, assignment, coordination, and review, and a documentation plan that included requirements and implementation procedures. All of these are in writing and have been made available on request to several library automation projects and major libraries in this country and abroad. In addition, some commercial organizations planning production retrieval applications have asked for material developed by BALLOTS.

3.6.2 Organizational level

This level concerns the characteristics of the library or library system that is the site of development. Clearly, a computer system is most easily transferred from one library to another that is similar in size, the nature of its collection, growth factors, and accessibility to computer facilities. In addition, a system, no matter how well designed, will not be transferable (except "in principle") to a library that does not recognize or is unwilling to change some of its present modes of operation as required (see section 3.7).

One aspect of transferability is the explicitness of the originating library's requirements. This includes the ways in which the library modified its internal organization to put the system to better use and the way (i.e., review and approval) in which it insured that the system would serve its actual needs. BALLOTS I is a prototype system and is dependent on the originating library because of the amount of experimentation that went into its development. The library did organize a separate Automation Department at the same level as its Acquisition and Catalog Departments, with subordinate data input and control units--a step that other libraries may find a valuable approach to centralizing responsibility and ensuring quality control. However, the actual procedures used were somewhat cumbersome, and depended a great deal on the locally developed text editor.

In planning for a production system, the library has grouped its technical processing and automation departments under one senior library official who previously had major responsibility for automation. For BALLOTS II, a plan for documenting and approving the library's production requirement was implemented. This will be a multivolume work approved by library department heads. It will specify in the most detailed way what the library needs in order to use a production system effectively.

3.6.3 Equipment level

This level includes the type of central processing unit, the size core storage, the type of secondary storage (tape or disk), and the range of peripheral devices (input and output), particularly those at the man-computer contact point--i.e., the input/display terminals in the library. Equipment is a major component in the transferability of a system. As with software, lack of standardization in the computer equipment industry seriously and adversely affects transferability. But computer manufacturers are rapidly moving in the direction of greater standardization. In the meantime, one must consider whether the same or similar basic equipment is used nationally; whether equipment has comes from small local manufacturers with limited service or sales staff; and whether any manufacturer-supplied custom modifications are central to the system design.

BALLOTS I used a standard model computer from a nationally known computer manufacturer. BALLOTS II will do the same. All pieces of peripheral equipment at Stanford are standard items. BALLOTS I examined terminal equipment developed by several vendors, but finally used highly reliable, production model typewriter terminals. BALLOTS II will use essentially the same central computer equipment. Terminals will be a video type, but those selected will come from a reliable manufacturer. They will meet general specifications for library bibliographic operations so that other libraries will be able to use the specifications and analysis produced by Stanford. In addition, the reliability experience of Stanford will be made available to other libraries. In spite of such attempts to make transferability as easy as possible at the equipment level, libraries should be aware that even with equipment from the same manufacturer, differences in configuration will affect ease of transferability.

3.6.4 Software level

This level includes the system software that allocates computer resources, provides communication links, and offers data manipulation services (e.g. text editing). It also includes applications software that edits, displays, searches, and prints out bibliographic data. Transferability at this level is affected by the type of programming language chosen, the extent of software documentation, the degree of design generality, and how dependent the system is on locally developed software, which in turn may depend on a particular local computer configuration. In general, lack of standardization in commercially available software and programming languages has a major effect on transferability.

BALLOTS I used PL/1 and Basic Assembly Language. Both are widely used, and PL/1 has many self-documenting characteristics. Programs were documented but a common format or set of standards was not used. The Stanford Computation Center uses OS, a widely used set of IBM system software, but its time-sharing and text-editing software is locally developed. However, these pieces of software have been effectively transferred and are now in daily use at the National Institutes of Health in Bethesda, Maryland. For BALLOTS II, a detailed set of programming documentation standards has been prepared. A well-known, fully documented, higher-level language will be used. Should a less well-known, machine-level language be used, it will be fully documented in its BALLOTS application. BALLOTS interface software will be fully documented so that transfer to another system requiring interface modification should be accomplished as easily as possible. BALLOTS II will continue to use IBM/OS.

Libraries considering the use of an on-line system developed elsewhere will also want to assess the degree of production on-line programming experience in their own computer center staff. This can best be done through discussions between the head librarian and the head of the computer center.

3.6.5 Library operations level

This level includes the procedures, forms, and staff training program for the day-to-day operations using the automation system. Transferability will be affected by how clearly and fully overall requirements are stated; by whether an overall set of procedures is designed to fullfil these requirements; by how clearly and fully the criteria for necessary forms are stated and used; by the amount of documentation of such requirements, procedures design, and forms criteria; and by the amount of formal training material that exists for training library staff in procedures and forms.

A modest number of procedures and forms were designed for BALLOTS I. One significant form is the universal bibliographic data form (see subsection 2.10.5), which can be used for computer-produced orders, claims, and cancellations. This form has been requested by other libraries. Owing to the limited size of the prototype operation, BALLOTS I training was of an informal, day-to-day, supervisory nature. Libraries should be aware that any sets of forms and procedures are imbedded in the organization where they were developed. The criteria used and the lessons learned in designing and using the procedures and forms are their most transferable aspects.

The detailed analysis that has established BALLOTS II library requirements has documented each manual procedure and each manual-automated (i.e., a terminal is used) procedure in terms of its input, output, and skill requirements. This documentation is the basis for an integrated procedure design in which we begin by documenting current procedures in a preliminary analysis; then document procedure requirements in a detailed analysis phase. While software and hardware problems and solutions are being explored in the general and detailed design phases, the procedures and forms for the library environment are also being designed. Also during the detailed design phase, personnel to be trained are identified, training sessions are planned, and training material is prepared. Training takes place during implementation and the effectiveness of the training, procedures, and forms is monitored during installation.

3.7 The Human Side of System Development

This section is placed last in chapter 3.0 not because it is last in importance, but because really it is of the greatest significance. Introducing an on-line system into a library for daily use is an experiment in planned change <25>. It is interesting to note that typewriters were not readily accepted in libraries even after their benefits were demonstrated <3>. Many readers are aware that an on-line system (unlike a batch system) affects the moment-by-moment working hours of the library staff. Furthermore, it is not a passive piece of technology like a typewriter or telephone. It is responsive and interactive, and its value depends heavily on the use made of it. The interactive nature of an on-line system poses serious design problems; it poses even more serious human problems.

The human problems stem from the need to involve library staff in computer system development and the potential adverse effect of development on individual and group satisfaction and achievement. Again, the comments of Overmyer's review <20, p. 247> are to the point:

> We may lament the limitations of the equipment, but we can know in advance exactly what it can and cannot do. We may consider the budget inadequate, but a firm figure does exist on which to formulate plans. But with people it can be a different story. People have the power to make or break a system, be it social, economic, or automation and the attitudes they bring to their jobs can have a great deal to do with the success or failure of an operation.

The Stanford Library Administration and the development staff were aware of the crucial role that the library staff were playing in the creation of an effective library computer system. They were equally aware of the anxiety potential of such a role. Several approaches were (and are being) taken that provide maximum attention to human considerations.

The first of these is open communication about what is being considered and how individual librarians can participate in shaping developments. Many members of the library staff participated in the early studies that led to the initial proposal. Regular reports on system development are made at the weekly library administrative conference meetings; minutes of these meeting are distributed to all offices in the library. At every series of orientation meetings for new library staff, the BALLOTS principal investigator has led a discussion on the library's automation work. The second approach was to recruit librarians with working library experience for the development staff. Other capable analysts with backgrounds in the humanities are part of the development team. This provides a common ground of professional experience and shared values that help keep the lines of communication open with the library staff. The third approach was the active participation of librarians on the development team in the library's staff association, in the University-wide librarians' association, and in local chapters of professional library organizations. This gives concrete evidence of the development staff's dedication to librarianship.

Stanford faculty were drawn into the early phases of BALLOTS I through an advisory committee (see section 2.2). Reports were also made to the University Committee on Libraries, which is composed of both faculty and students. Project BALLOTS newsletters were prepared and distributed to libraries, library schools, and a growing number of individual librarians. Write-ups were prepared for university publications. It is our belief that all existing channels of communication can be judiciously and effectively used to create an awareness of the library's efforts to improve its operations. The same restrained approach advocated in communication with the library staff (see below) has been found most useful in communication with the university community.

Members of the library administration give continuing support to the automation effort, formally in meetings, but also informally in conversations. There have been times when the enthusiasm and expectations for BALLOTS were unrealistically high, both about how much the system could do and about how soon it would be able to do it. It is our experience that library administrators and development staff must walk a fine line between saying too much about automation and saying too little. If there is a choice, we suggest erring on the side of emphasizing the difficulty of the task and the limitations of the system.

As the prototype system moved into the library, it was demonstrated to the staff in small groups. The Data Preparation and Data Control units operated out of a room adjacent to the staff lounge. Maximum visibility was considered to be important. When the new operations seemed to affect the ongoing work of a technical processing department, steps were taken to relieve the strain. Recall (see subsection 2.10.1) the help that Acquisition and Cataloging received in handling BALLOTS processing.

One of the multiple benefits that can emerge from an automation development effort is an opportunity for the library to examine itself. The introduction of a computer into the library may seem to solve many of the library's problems; at the same time it often brings to the surface other problems--people problems. It is inaccurate to blame the computer for all of the storm that can surround its introduction into the library. It does affect individuals and their individual work, work relationships, and the existing organizational structures. If people are dissatisfied with what seem to be the trivial, boring, or dead-end aspects of their jobs, the computer will not necessarily solve this. Instead, some workers will cling even harder to the clerical aspects of their job with which they feel secure. Others will find doing repetitive typing at a terminal only slightly more interesting than doing it at a typewriter. If there are personality conflicts in a particular department, the presence of computer development, when teamwork is so common, may provide more occasions for differences to occur. If there are supervisory problems, the computer will not make them disappear. Computers cannot teach supervision or promote satisfying learning. Only people--skilled, sensitive people such as one finds in many libraries--can do that. If library policy seems to the staff to place little value on staff development, on staff participation in management, and on the mutual flow of information up the administrative hierarchy as well as down, a computer system may well be received with skepticism, anxiety, and covert opposition.

But automation CAN be the occasion, as we believe it has been at Stanford, to demonstrate the importance of the individual librarian. It can provide the opportunity to relieve much of the tedious repetitive work that has been, up to this time, a necessary part of library operations. It can improve staff communication by giving people from different departments a chance to work together on common tasks. It can cause supervisors to take a fresh look at problems and to consider adopting some of the solutions that have been found useful in business, such as planning by objective. Automation can cause the library staff to question the current usefulness of forms, procedures and organizational structures developed to fulfill needs that have since changed. It can improve library administration by causing administrators to rethink the means and ends of a library service that must respond to the changing shape of university education.

There is no substitute for the recognition of individual contributions to development work made by the library staff. The successful implementation of an on-line library system is primarily a tribute to the staff. The installation of a computer system can be an opportunity, as we have shown, to create a more human environment inside a library. In so doing the total effectiveness of the library is enhanced. Its value as a primary source of humanistic knowledge is reaffirmed.

4.0 RECOMMENDATIONS

This chapter contains recommendations derived from the development of an on-line prototype system for a large library. They are directed to university librarians who may be considering on-line system development; to others in the university community, such as computer specialists, who would be cooperating in such an effort; in particular, to the library staff whose contribution is indispensable in feasibility evaluation, system analysis, and operational effectiveness; to equipment manufacturers who will be designing equipment for library automation; and to the professional library community that is interested in improving the quality of library operations in all areas. Many of our conclusions may seem pessimistic or overwhelming to those who have had little or no contact with large on-line systems development. It is NOT our intention to be optimistic or pessimistic. It IS our intention to state as clearly and as completely as possible the key requirements, as we see them, for on-line library systems development <37>. Then individual libraries and individual librarians will have a better basis for making decisions. Knowing the pitfalls, knowing the problems, knowing what has not been done or has been done with less than maximum efficiency is a valuable sort of knowledge--perhaps the most valuable. It is in this spirit that the following recommendations are presented.

4.1 Feasibility Recommendation

A LIBRARY CONSIDERING ON-LINE SYSTEM DEVELOPMENT SHOULD CONDUCT FEASIBILITY STUDIES THAT MAKE CLEAR THE ADVANTAGES AND DISADVANTAGES OF IN-HOUSE DEVELOPMENT, CONTRACTED DEVELOPMENT, AND A MIXTURE OF BOTH.

Feasibility studies involve assessing the economic, technical, and other less tangible factors of development. There is a truism that given enough time and money anything can be accomplished in computer system development. Like most truisms, this one has little relation to the realities of organizational conditions. But even if feasibility studies were based on all that could be asked for in the way of time and money, this is not sufficient. The library must look at itself, but it must also look at the others concerned. To what extent does the computer center have the willingness, peronnel, and experience to support on-line system development <33>? To what extent do the faculty and students see this development as an attempt to improve service as opposed to another instance of creeping computer control. In looking at itself, the library must assess its own willingness to change, the attitudes of its staff, and the priorities of its long-range development plan. In looking at commercial software products and services, the library must be able to assess the costs of developing these products and services on its own. The library must be able, with the assistance of a consultant if necessary, to determine what additional costs and effort it would have to bear in installing an externally designed system. With either in-house or contracted development, the library must give careful consideration to concrete means for ensuring contractual technical, schedule, and cost performance and user approval of the system design.

4.2 Economic Recommendation

AT THE PRESENT TIME, THE COST OF DEVELOPING LARGE, ON-LINE LIBRARY SYSTEMS MUST BE SUPPORTED BY FUNDING OUTSIDE THE LIBRARY'S OPERATING BUDGET.

Libraries will need to seek financial support for on-line system development from the university or from agencies outside the university. This requires a clear understanding of the purposes and potential value of on-line systems as well as of the difficulties and costs. It is usually necessary for the library to demonstrate concrete efforts to make internal changes to show that it would use the proposed system to the best advantage. Such changes may be more services, or higher levels of services, or both. Large-scale technological assistance to libraries is a fairly new concept to many head librarians. It is even newer to many university administrators, who may think that books and librarians are all that is needed to keep the library operating smoothly. The library must be willing to review realistically the costs in its existing manual systems and to describe accurately the displaceable costs in the areas affected by automation, if it wants to support the arguments for university investment.

4.3 Management Recommendation

ON-LINE SYSTEM DEVELOPMENT SHOULD HAVE PROFESSIONAL COMPUTER MANAGEMENT, UNDER THE POLICY DIRECTION OF THE LIBRARY AND SUBJECT TO ITS CONTINUING REVIEW AND APPROVAL.

There are many more on-line systems in operation now than there were five years ago. The people developing them are more experienced and the systems in turn are growing more complex. Managerial experience in on-line production system development is almost never found in libraries and rarely in university computer centers. There is no substitute for an experienced manager to plan, control, coordinate, and take responsibility for an effort joining the library with the computer center. The search for such a manager may extend beyond the university community; an enthusiasm for the challenge of library automation and a willingness to learn about libraries are the essential personal attributes. Frequently, senior computer center personnel are in a position to advise the library in assessing background and technical qualifications. A competent manager is only one factor in making sure that the library gets the system it needs. Formal mechanisms are needed to maintain a user orientation, such as a policy committee, independent technical review, and written approval of all design documents. A capable manager will welcome such monitoring activities as evidence of concerted user involvement.

4.4 Staffing Recommendation

LIBRARIES CONSIDERING ON-LINE SYSTEMS SHOULD SECURE OR CONTRACT WITH TECHNICAL PERSONNEL HAVING ON-LINE EXPERIENCE, PREFERABLY IN SOME KIND OF BIBLIOGRAPHIC/RETRIEVAL APPLICATION.

Developing an on-line production system is clearly a significantly different task from developing a batch system or developing an experimental or demonstration on-line system. To most librarians, computer experience is all of a piece and such differences do not seem important. For the reasons of on-line systems complexity mentioned above (in addition to the inherent complexity of the library application), differences in the computer experience of potential staff cannot be ignored. Contracting development work poses similar problems, although probably not of the same magnitude. The library is thus in the position of trying to assess technical credentials in another professional field. In addition to seeking assistance in the university computer center, the library may be able to determine the qualifications of a firm by contacting previous clients, especially libraries, and by asking the opinion of knowledgeable people in library professional organizations.

4.5 Documentation Recommendation

DOCUMENTATION IS A PRIMARY DEVELOPMENT TASK, AND FUNDS, SPECIALIZED PERSONNEL, AND FORMAL MANAGEMENT COMMMITMENT ARE NEEDED FOR ITS ACCOMPLISHMENT.

Documentation is a means of controlling development costs, promoting user-oriented system development, and ensuring reliable production operations. There is abundant evidence in library automation activity <18, p. 50> and in the computer world generally <23, p. 11> that most documentation is either lacking or poorly done. Without a management commitment to documentation, supported by written standards, procedures, and personnel, the documentation output of library system development will continue to be unsatisfactory. The resulting system will be less useful to others and will incur higher operating costs due to the unsatisfactory documentation. The library must make specific and mandatory documentation requirements of its own development group or of an outside development group.

4.6 Equipment Recommendation

SPECIFICATIONS FOR VIDEO (CRT) TERMINAL EQUIPMENT TO SUPPORT ON-LINE LIBRARY OPERATIONS SHOULD BE BROUGHT TO THE ATTENTION OF MANUFACTURERS.

The limitations of typewriter terminal equipment became apparent during prototype operations. Several upper-/lower-case video terminals have come on the market in the past year, but there is no evidence that the requirements of library operations have influenced the design of these terminals. The point of contact between the librarian and the computer system and eventually between the public user and the system is of vital importance. Early in system development a library should examine its terminal requirements and put them in writing to be sent to manufacturers. Specifications cannot be too detailed and at a minimum should cover physical characteristics such as screen size, operating characteristics such as editing capabilities, costs such as single unit and cluster prices, and performance characteristics such as transmission rates.

4.7 National Planning Recommendation

THE DEVELOPMENT OF LARGE ON-LINE LIBRARY SYSTEMS SHOULD BE PLANNED AND IMPLEMENTED ON A REGIONAL BASIS.

The development of a large, computerized, technical processing system is so complex that it should be done preferably at a limited number of libraries located throughout the country. A system developed at each of these centers could be shared in either of two ways: (1) by disseminating complete documentation so that a maximum amount of the design could be adapted for system development in other libraries, (2) by each center forming a consortium in which several libraries could use the services of a central system. We believe the second of these two alternatives is the more technically and economically feasible at this time. This feasibility is limited by telecommunications costs where distance is a factor and by coaxial cable or microwave requirements in applications that use visual displays. The second alternative could involve a commercial organization as the central system. In some parts of the country this may be desirable.

Either alternative in which a library is the central system requires a major marketing effort if the full benefit of system development is to be shared. In other words, libraries considering on-line systems should be able to shop around and find full documentation on both of the approaches suggested above. The federal government should assist universities in marketing new technological systems developed with federal funds;

this might be done by funding conferences for technical and administrative personnel, training sessions for potential users, demonstrations where a system is operating, and regional MARC center operations.

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35. A comprehensive view of the impact of computing technology on library functions can be found in System Development Corporation's TECHNOLOGY AND LIBRARIES. Part of this report is given as chapter 7, "Some Problems and Potentials of Technology as Applied to Library and Informational Services," in Knight and Nourse.

36. Booz, Allen, Hamilton, Inc.'s study describes many of the management problems of large libraries in responding to change in the university.

37. Some readers may wish to compare our recommendations with those of Booz, Allen, Hamilton, Inc. (see pp. 29-31, 49 of that study), especially in the data processing area.

38. The Computation Center assumes all responsibility for procuring, installing, and changing the location of 2741 terminals, once the requesting unit has submitted an order. All equipment is the property of the Center and all is leased to the users at uniform rates. Users may buy their own 2741's if they desire, but because of rapid developments in terminals and the relatively high cost of the 2741 (over $3,000), there have been practically no direct purchases by Stanford users. Project BALLOTS has not purchased any of the terminals.

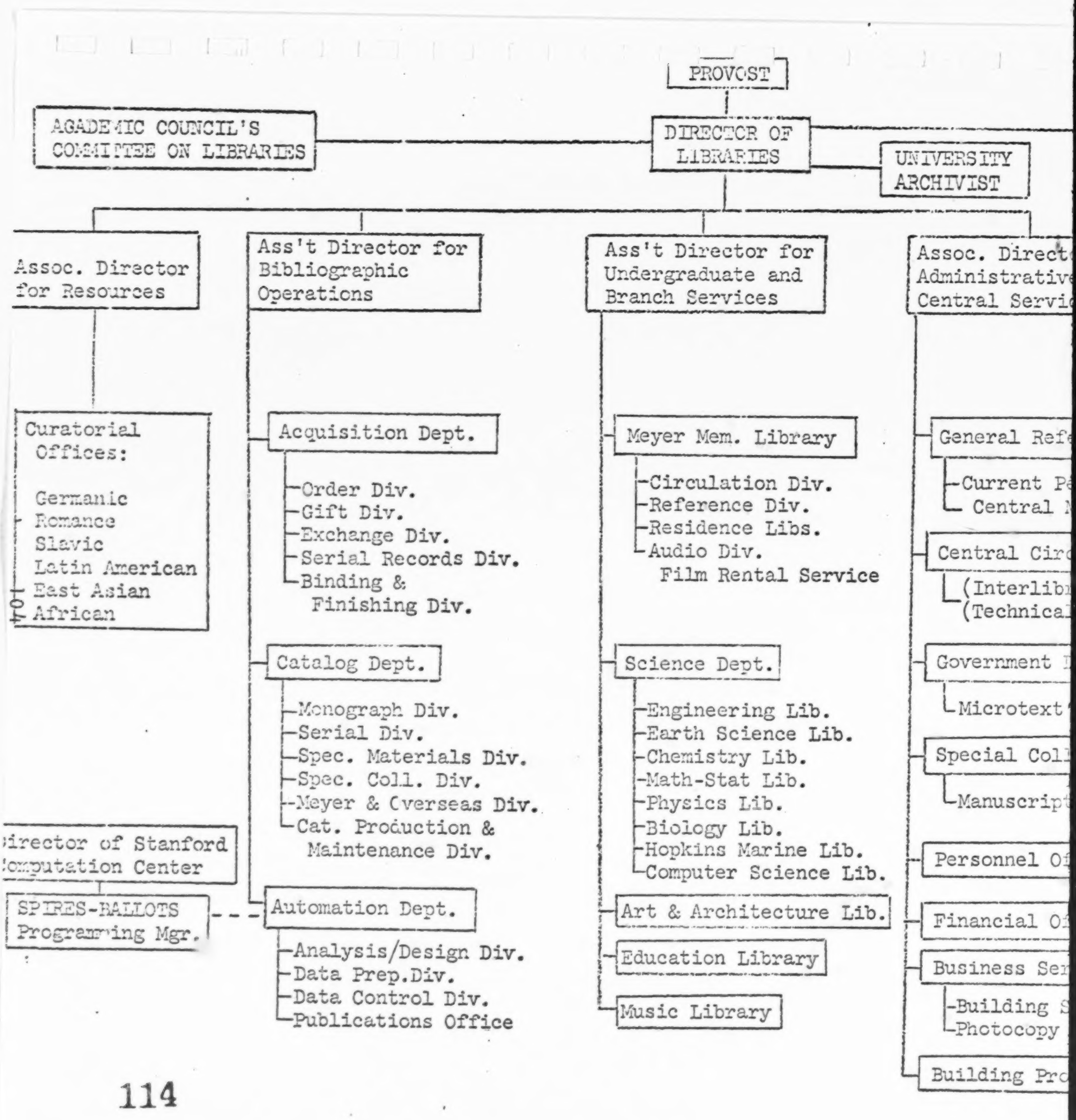
A typical terminal installation consists of three parts: the IBM 2741 terminal; an elongated work table the same height as the terminal; and data communication equipment. The work tables are not supplied by IBM and are made to order. It is practically impossible to work at a terminal without the custom-made table, which also serves to hold the data communication equipment. Either of two sorts of equipment may be used for data communication: the Bell System's 103-A Dataphone, or an acoustic coupler. Both devices are in use at Stanford. They are equal in cost and the Computation Center indicates that there is almost no difference in reliability.

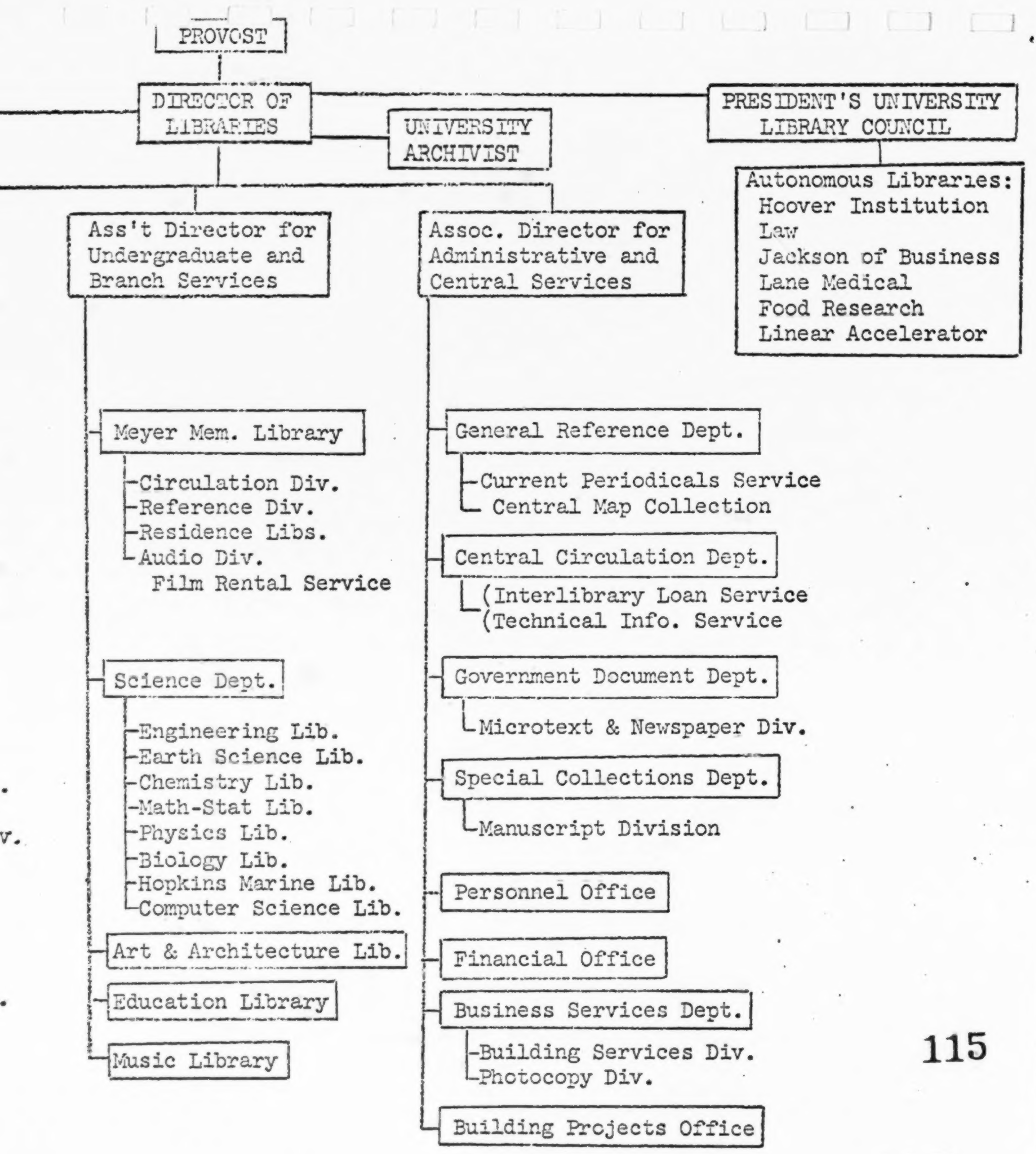
6.0 APPENDICES

6.1 Stanford University Libraries

(referred to in section 2.3)

1. Library Organization Chart
2. Library Statistics for the Year 1969-70
3. SCOPE Document Contents
4. The Libraries of Stanford University


PROVOST
ACADEMIC COUNCIL'S COMMITTEE ON LIBRARIES
DIRECTOR OF LIBRARIES
UNIVERSITY ARCHIVIST
Assoc. Director for Resources
Ass't Director for Bibliographic Operations
Ass't Director for Undergraduate and Branch Services
Assoc. Direct
Administrative
Central Servic
Curatorial Offices:
Germanic
Romance
Slavic
Latin American
East Asian
African
Acquisition Dept.
-Order Div.
-Gift Div.
-Exchange Div.
-Serial Records Div.
-Binding & Finishing Div.
Catalog Dept.
-Monograph Div.
-Serial Div.
-Spec. Materials Div.
-Spec. Coll. Div.
-Meyer & Overseas Div.
-Cat. Production & Maintenance Div.
Automation Dept.
-Analysis/Design Div.
-Data Prep.Div.
-Data Control Div.
-Publications Office
irector of Stanford
omputation Center
SPIRES-BALLOTS Programming Mgr.
Meyer Mem. Library
-Circulation Div.
-Reference Div.
-Residence Libs.
-Audio Div.
Film Rental Service
Science Dept.
-Engineering Lib.
-Earth Science Lib.
-Chemistry Lib.
-Math-Stat Lib.
-Physics Lib.
-Biology Lib.
-Hopkins Marine Lib.
-Computer Science Lib.
Art & Architecture Lib.
Education Library
Music Library
General Ref
-Current P
Central
Central Circ
(Interlib
(Technica
Government
-Microtext
Special Coll
-Manuscript
Personnel Of
Financial Of
Business Ser
-Building
-Photocopy
Building Pro
104



- PROVOST
  - DIRECTOR OF LIBRARIES
    - UNIVERSITY ARCHIVIST
    - PRESIDENT'S UNIVERSITY LIBRARY COUNCIL
      - Autonomous Libraries:
        - Hoover Institution
        - Law
        - Jackson of Business
        - Lane Medical
        - Food Research
        - Linear Accelerator
    - Ass't Director for Undergraduate and Branch Services
      - Meyer Mem. Library
        - Circulation Div.
        - Reference Div.
        - Residence Libs.
        - Audio Div.
          - Film Rental Service
      - Science Dept.
        - Engineering Lib.
        - Earth Science Lib.
        - Chemistry Lib.
        - Math-Stat Lib.
        - Physics Lib.
        - Biology Lib.
        - Hopkins Marine Lib.
        - Computer Science Lib.
      - Art & Architecture Lib.
      - Education Library
      - Music Library
    - Assoc. Director for Administrative and Central Services
      - General Reference Dept.
        - Current Periodicals Service
        - Central Map Collection
      - Central Circulation Dept.
        - (Interlibrary Loan Service
        - (Technical Info. Service
      - Government Document Dept.
        - Microtext & Newspaper Div.
      - Special Collections Dept.
        - Manuscript Division
      - Personnel Office
      - Financial Office
      - Business Services Dept.
        - Building Services Div.
        - Photocopy Div.
      - Building Projects Office

1-1-70

STATISTICS FOR THE YEAR 1969-70

Table 1: Expenditures

	Salaries(a) (Regular/Requisition)(b) Total	Acquisitions	Binding	Supplies and Equipment	Total
University Libraries	($2,104,272/198,578) $2,302,850	$1,024,019	$153,034	$586,549(c)	$4,066,452
Increase over '68-69	+4.8%	+10.2%	+10.6%	+10.9%	+6.9%
Food Research Institute	(24,307/903) 25,210	4,553	1,638	479	31,880
Hoover Institution Library	(608,896/28,518) 637,414	185,844	13,790	71,661	908,709
Jackson Library of Business	(180,607/25,523) 206,130(d)	62,747	10,000	15,418	294,295
Lane Medical Library	(102,483/26,625) 129,108	72,011	17,959	21,984	241,062
Law Library	(149,333/12,041) 161,374	113,460	9,432	15,204	299,470
Linear Accelerator Center Library	(82,902/ -) 82,902	36,926	2,227	8,681	130,736
TOTALS	($3,252,800/292,188) $3,544,988	$1,499,560	$208,180	$719,976	$5,972,704
Total Increase over 1968-69	+6%	+6.1%	+8.3%	+6.3%	+5.4%

(a) Includes Staff Benefits

(b) Does not include Work Study

(c) Includes $321,592 computer time and related supplies and equipment expenses for automation

(d) Does not include salaries of serials record project, $27,775.

Table 4: Cataloging*

			Cards Prep
	New Titles Cataloged	Physical Items Newly Processed	National Union Catalog
University Libraries	58,239	72,493	43,931
Food Research Institute	1,172	1,172	---
Hoover Institution	18,361	31,843	10,593
Jackson Business	3,225	6,336	---
Lane Medical	2,506	4,525	89
Law Library	4,341	13,890	---
Linear Accelerator Center	6,428	8,828	---
TOTALS	94,272	139,087	54,613

* Includes Books and Pamphlets, Microfilms, Microform Sheets, Phonorecords,

** Statistics not kept.

Table 4: Cataloging*

			Cards Prepared for the:		
	New Titles Cataloged	Physical Items Newly Processed	National Union Catalog	State Union Catalog	Stanford Catalogs
	58,239	72,493	43,931	6,306	531,420
ite	1,172	1,172	---	---	**
	18,361	31,843	10,593	6,550	74,566
	3,225	6,336	---	---	24,879
	2,506	4,525	89	---	1,101
	4,341	13,890	---	---	34,840
enter	6,428	8,828	---	---	**
	94,272	139,087	54,613	12,856	666,806

des Books and Pamphlets, Microfilms, Microform Sheets, Phonorecords, etc.

stics not kept.

Table 2: Library Staff

	Librarians and other Professionals*	Library Assistants *	Casual Employees**	Total
University Libraries	86.55	173.83	52.293	312.673
SPIRES/BALLOTS Project	22.0	2.0	1.00	25.00
Food Research Institute	1.0	2.0	.23	3.23
Hoover Institution	29.0	41.75	9.25	80.0
Jackson Business	9.3	13.5	6.86	29.66
Lane Medical	4.5	13.0	4.7	22.2
Law Library	5.5	14.75	3.0	23.25
Linear Accelerator Center	4.125	5.125	0	9.25
TOTALS	161.975	265.955	77.333	505.263

* Actual numbers as of May 31, 1970.

** Full-time equivalents of personnel on salary requisitions.

Table 3: Serial Titles Currently Received

	Newspapers	Other Serials
University Libraries	71*	32,476
Food Research Institute	0	709
Hoover Institution	346	3,441
Jackson Business	31	4,514
Lane Medical	0	2,581
Law Library	12	4,611
Linear Accelerator Center	0	616
TOTALS	460	48,948

*In addition, the University has available the 157 newspapers on microfilm that it cooperatively supports through the Association of Research Libraries.

Table 5: Growth and Extent of Resources, July 1, 1969 - Jun

UNIVERSITY LIBRARIES	Volumes			Microfilm Re
	Gross Increase	Net Increase	Total	Net Increase
Main Library:				
Central Circulation Department:				
Main Stack & Meyer Basement	64,458	11,844	922,019	---
Engineering Library	2,898	316	55,524	763
General Reference Room	2,359	-3,072	28,819	---
Government Document Department	8,252	8,252	137,966	---
Jones Collection - Creative Writing	---	---	1,860	---
Microtext Collection	---	---	---	1,501
Newspaper Room	14	-96	15,514	---
Special Collections	5,467	1,644	72,605	---
University Archives	715	714	9,141	---
SUBTOTAL	84,163	19,602	1,243,448	2,264
Art and Architecture	61,150	60,950	60,950	---
Asian Languages	0	0	458	---
Branner Earth Sciences	2,322	2,296	44,490	---
Briggs Memorial - English	177	177	2,112	---
Chemical Engineering	228	223	3,118	---
Classics	140	140	2,735	---
Communications	217	180	3,397	---
Computer Science	990	863	5,754	---
Cubberley Education	2,590	1,869	74,036	26
Curriculum Library	266	218	6,565	---
Dudley Herbarium	233	233	8,160	---
Electrical Engineering-Solid State	144	-106	2,643	10
Engineering Economics	---	---	231	---
Falconer Biology	2,058	2,000	30,735	---
Graduate Program in Humanities	68	68	783	---
Guggenheim Radioscience	205	205	2,012	---
Hansen Microwave Laboratories	340	340	4,646	---
Hopkins Marine Station	1,321	1,313	16,259	---
Mathematical Sciences	1,759	1,725	21,627	---
Auxiliary Collection	13	-265	9,030	---
Memorial Church Library	0	0	50	---
Meyer Memorial Library	8,686	8,305	99,601	162

: Growth and Extent of Resources, July 1, 1969 - June 30, 1970

	Volumes			Microfilm Reels		Microtext Sheets & Cards	
	Gross Increase	Net Increase	Total	Net Increase	Total	Net Increase	Total
ment:							
ent	64,458	11,844	922,019	---	---	---	---
	2,898	316	55,524	763	1,286	623	2,283
	2,359	-3,072	28,819	---	---	---	---
ment	8,252	8,252	137,966	---	---	13,802	151,229
e Writing	---	---	1,860	---	---	---	---
	---	---	---	1,501	27,501	29,618	285,144
	14	-96	15,514	---	---	---	---
	5,467	1,644	72,605	---	---	---	---
	715	714	9,141	---	---	---	---
	84,163	19,602	1,243,448	2,264	28,787	44,043	438,656
	61,150	60,950	60,950	---	---	---	---
	0	0	458	---	---	---	---
	2,322	2,296	44,490	---	66	---	---
	177	177	2,112	---	---	---	---
	228	223	3,118	---	---	---	---
	140	140	2,735	---	---	---	---
	217	180	3,397	---	---	---	---
	990	863	5,754	---	6	132	277
	2,590	1,869	74,036	26	365	102	482
	266	218	6,565	---	---	---	---
	233	233	8,160	---	---	---	---
id State	144	-106	2,643	10	93	---	---
	---	---	231	---	---	---	---
	2,058	2,000	30,735	---	---	---	---
ties	68	68	783	---	---	---	---
	205	205	2,012	---	---	---	---
ies	340	340	4,646	---	---	200	1,700
	1,321	1,313	16,259	---	9	---	85
	1,759	1,725	21,627	---	4	---	---
	13	-265	9,030	---	---	---	---
	0	0	50	---	---	---	---
	8,686	8,305	99,601	162	673	---	---

Table 5: Continued

	Volumes			Microfilm	
	Gross Increase	Net Increase	Total	Net Increase	
Modern European Languages	35	35	1,010	---	
Music (including Archive of Recorded Sound)	2,997	2,997	25,793	118	
Physical Education - Women	---	---	6,896	---	
Physics	1,558	1,532	19,101	---	
Auxiliary Collection	5	-9,835	2,843	---	
Plasma Physics	85	85	997	---	
Ryan Nuclear Technology	12	12	211	---	
Swain Chemistry	854	849	15,279	---	
Systematic Biology	494	494	10,452	---	
Tanner Memorial, Philosophy	288	138	4,550	---	
Timoshenko Collection	---	---	658	---	
V. J. West Memorial, Political Science	114	114	5,269	---	
SUBTOTAL	173,512	96,756	1,735,899	2,580	30
Stanford in Austria	183	183	2,609	---	
Stanford in Britain	237	237	2,820	---	
Stanford in France	169	169	4,099	---	
Stanford in Germany	135	135	4,526	---	
Stanford in Italy	258	258	3,683	---	
Classical Center in Rome	134	134	1,425	---	
Residence Hall Libraries on Stanford Campus*	---	514	11,095	---	
TOTAL FOR UNIVERSITY LIBRARIES	174,628	98,386	1,766,156	2,580	3

* See Table 5A

Table 5: Continued

	Volumes			Microfilm Reels		Microtext Sheets & Cards	
	Gross Increase	Net Increase	Total	Net Increase	Total	Net Increase	Total
	35	35	1,010	---	---	---	---
	2,997	2,997	25,793	118	443	---	912
	---	---	6,896	---	---	---	---
	1,558	1,532	19,101	---	---	---	---
	5	-9,835	2,843	---	---	---	---
	85	85	997	---	---	---	---
	12	12	211	---	---	---	---
	854	849	15,279	---	---	---	---
	494	494	10,452	---	---	---	231
	288	138	4,550	---	---	---	---
	---	---	658	---	---	---	---
cal e	114	114	5,269	---	---	---	---
	173,512	96,756	1,735,899	2,580	30,446	44,477	442,340
	183	183	2,609	---	---	---	---
	237	237	2,820	---	---	---	---
	169	169	4,099	---	---	---	---
	135	135	4,526	---	---	---	---
	258	258	3,683	---	---	---	---
	134	134	1,425	---	---	---	---
*	---	514	11,095	---	---	---	---
IES	174,628	98,386	1,766,156	2,580	30,446	44,477	442,340

* See Table 5A

Table 5: Continued

	Volumes			M
COORDINATE LIBRARIES	Gross Increase	Net Increase	Total	I
Food Research Institute	1,681	1,681	56,284	
Hoover Institution	43,264	43,246	1,004,096	
Jackson Business	10,974	9,134	153,574	
Lane Medical: Main	7,125	7,047	225,980	
Branches: Anatomy	443	443	6,828	
Medical Microbiology	192	192	4,337	
Law Library	9,551	8,955	187,288	
Linear Accelerator Center	6,478	4,422	42,829	
TOTAL FOR COORDINATE LIBRARIES	79,707	75,120	1,681,216	1,
TOTAL FOR UNIVERSITY LIBRARIES	174,628	98,386	1,766,156	2,
GRAND TOTAL	254,335	173,506	3,447,372	3,

Table 5: Continued

	Volumes			Microfilm Reels		Microtext Sheets & Cards	
	Gross Increase	Net Increase	Total	Net Increase	Total	Net Increase	Total
e	1,681	1,681	56,284	---	27	---	---
	43,264	43,246	1,004,096	755	9,903	---	---
	10,974	9,134	153,574	377	1,293	21,808	55,336
	7,125	7,047	225,980	---	5	---	---
	443	443	6,828	---	---	---	---
	192	192	4,337	---	---	---	---
	9,551	8,955	187,288	29	860	4,310	42,307
ter	6,478	4,422	42,829	---	---	2,499	27,108
LIBRARIES	79,707	75,120	1,681,216	1,161	12,088	28,617	124,751
LIBRARIES	174,628	98,386	1,766,156	2,580	30,446	44,477	442,340
	254,335	173,506	3,447,372	3,741	42,534	73,094	567,091

SYSTEM SCOPE for LIBRARY AUTOMATION and GENERALIZED INFORMATION STORAGE AND RETRIEVAL at STANFORD UNIVERSITY

February, 1970
Stanford University
Stanford, California 94305

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ii Contributors

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THE LIBRARIES OF STANFORD UNIVERSITY

- STANFORD UNIVERSITY LIBRARIES
  - BIBLIOGRAPHIC OPERATIONS
    - Acquisitions Department
      - Binding and Finishing Division
      - Exchange Division
      - Gift Division
      - Order Division
      - Serial Records Division
    - Catalog Department
      - Catalog Production and Maintenance
      - Meyer and Overseas Division
      - Monograph Division
      - Serial Division
      - Special Collections Division
      - Special Materials Division
  - CENTRAL SERVICES
    - Circulation Department
    - Financial Office
    - General Reference Department
      - Current Periodicals Service
      - Reference Desk
      - Asian Languages Library
      - Briggs Library
      - Classics Library
      - Communications Library
      - Graduate Program in the Humanities
      - Memorial Church Library
      - Modern European Languages Library
      - Tanner Philosophy Library
      - West Political Science Library
    - Government Document Department
      - Federal Documents
      - Foreign Documents
      - International Documents
      - State Documents
      - U.S. Classification
      - Microtext and Newspapers
    - Special Collections Department
      - Institute of American History
      - Jones Library
      - University Archives
  - UNDERGRADUATE AND BRANCH LIBRARY SERVICES
    - Art and Architecture Library
    - Cubberley Education Library
      - Main Branch

  - Women's P.E. Library
- Meyer Memorial Library
  - Audio Division
    - Audio Services
  - Circulation Division
  - Reference Division
- Music Library
  - Music Library
  - Archive of Recorded Sound
- Science Department
  - Branner Geology Library
  - Computer Science Library
  - Dudley Herbarium Library
  - Engineering Library
    - Main Branch
    - Electrical Engineering/Solid State
    - Engineering Economic Planning Library
    - Guggenheim Aeronautics/Radio Science
    - Ryan Nuclear Technology Library
  - Falconer Biology Library
    - Main Branch
    - Systematic Biology Library
  - Math-Stat Library
  - Physics Library
    - Main Branch
    - Hansen Microwave Lab Library
    - Plasma Physics Library
  - Swain Chemistry Library
    - Main Branch
    - Chemical Engineering Library
- Hopkins Marine Station Library
- Inter-Library Loan
- Technical Information Service

COORDINATE LIBRARIES

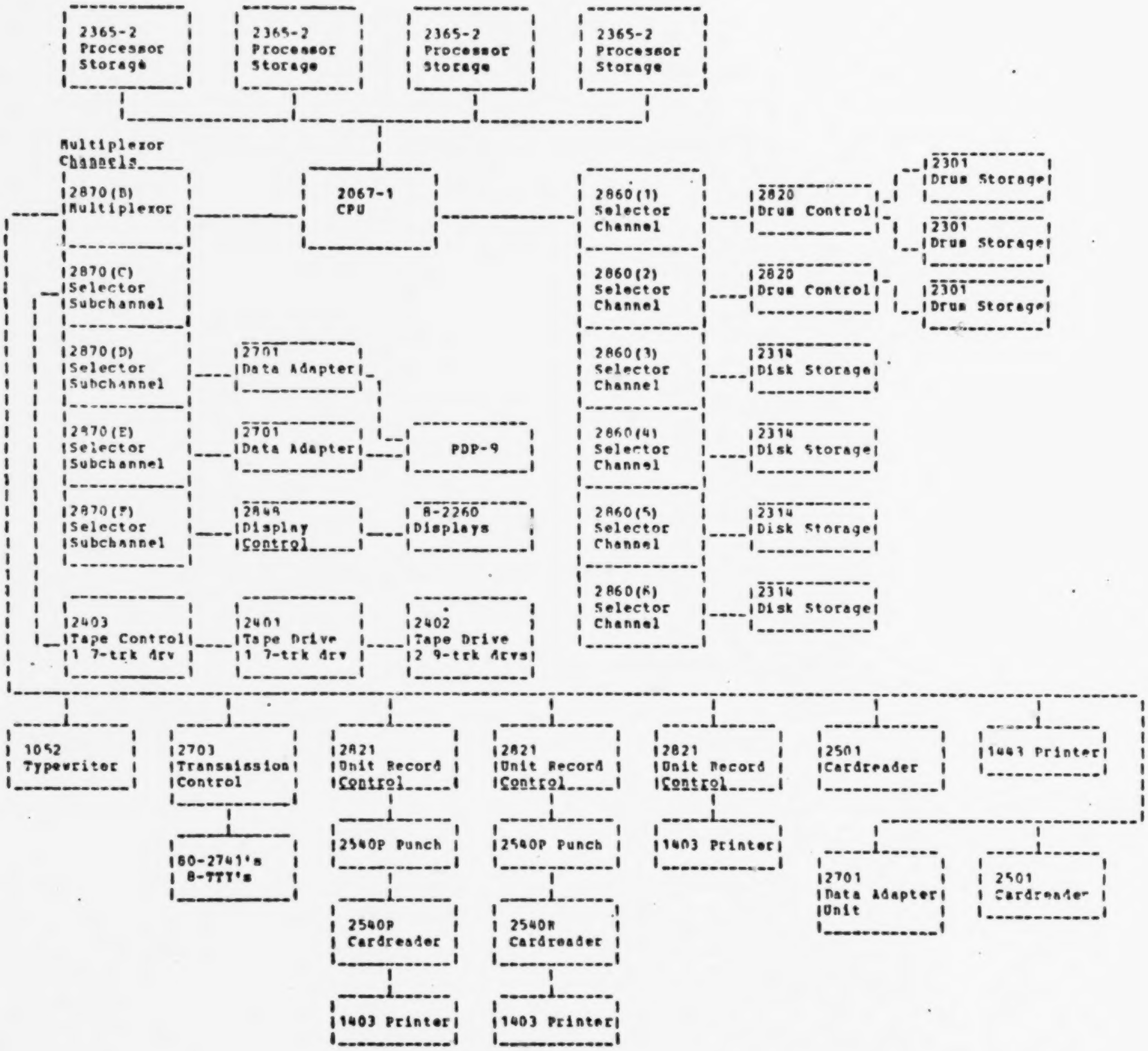
- Food Research Institute Library
- Hoover Institution Library
- Jackson Library of Business
- Lane Medical Library
  - Main Branch
  - Anatomy Library
  - Medical Microbiology Library
- Law Library
- Stanford Linear Accelerator Center Library

6.2 Campus Facility Computer

(referred to in subsections 2.4.1 and 2.4.2 and in section 3.2)

1. Campus Facility 360/67
   Machine Configuration
2. Rate Chart for IBM 360/67

Campus Facility 360/67 Machine Configuration


2365-2 Processor Storage
2365-2 Processor Storage
2365-2 Processor Storage
2365-2 Processor Storage
Multiplexor Channels
2870(B) Multiplexor
2067-1 CPU
2860(1) Selector Channel
2820 Drum Control
2301 Drum Storage
2301 Drum Storage
2870(C) Selector Subchannel
2860(2) Selector Channel
2820 Drum Control
2301 Drum Storage
2870(D) Selector Subchannel
2701 Data Adapter
2860(3) Selector Channel
2314 Disk Storage
2870(E) Selector Subchannel
2701 Data Adapter
PDP-9
2860(4) Selector Channel
2314 Disk Storage
2870(F) Selector Subchannel
2848 Display Control
8-2260 Displays
2860(5) Selector Channel
2314 Disk Storage
2860(6) Selector Channel
2314 Disk Storage
2403 Tape Control 1 7-trk drv
2401 Tape Drive 1 7-trk drv
2402 Tape Drive 2 9-trk drvs
1052 Typewriter
2703 Transmission Control
80-2741's 8-TTY's
2821 Unit Record Control
2540P Punch
2540P Cardreader
1403 Printer
2821 Unit Record Control
2540P Punch
2540R Cardreader
1403 Printer
2821 Unit Record Control
1403 Printer
2501 Cardreader
1443 Printer
2701 Data Adapter Unit
2501 Cardreader

RATE CHART FOR IBM 360/67:

SERVICE OR PRIORITY	TIME LIMIT	ADDITIONAL SERVICE CHARGE	..........RATES............ 0-5MIN	5-10MIN	10+MIN
Emergency	--	$25	+ $9/min	$12/min	$16/min
Urgent Short	<5min	$5	+ $9/min		
Urgent Long	>5min	$5	+ $9/min	$12/min	$16/min
Priority Short	<5min	$2.50	+ $9/min		
Priority Long	>5min	$2.50	+ $9/min	$12/min	$16/min
Standard Short	<1min	-	$9/min		
Standard Long	>1min	-	$9/min	$12/min	$16/min
Idle	<1min	-	$4/min		
Overnight	none	-	$7/min declining		
High Speed Batch	none	-	$9/min	$12/min	$16/min

6.3 Detailed Analysis Standards

(referred to in subsection 2.5.3)

1. Library Requirements Analysis Forms (DS.100)
2. Data Element Initital Description Form B-1 (DS.101)
3. Library Organization Form B-2 (DS.102)
4. Training Requirements Form B-3 (DS.103)
5. Input Record Description Form B-4 (DS.104)
6. Output Record Description Form B-5 (DS.105)
7. Internal Record Description Form B-6 (DS.106)
8. Processing Rules Form B-7 (DS.107)
9. Interface Description Form B-8 (DS.108)
10. Input Record Content Form B-9 (DS.109)
11. Internal Record Content Form B-10 (DS.110)
12. Performance Requirements Form B-11 (DS.111)
13. Control Requirements Form B-12 (DS.112)
14. Manual Procedure Abstract Form B-18 (DS.117)

SPIRES/BALLOTS PROJECT DOCUMENTATION STANDARD 100	Section Page 1 of 2 New ( ) Rev (x) Date 6/23/7

TITLE: LIBRARY REQUIREMENTS ANALYSIS FORMS

PURPOSE. During Phase B of the System Development Process (See AS.001) the operational requirements to be met by the new manual-computer library system are established. These requirements are stated precisely (quantatively wherever possible) and in detail. Forms are a major tool in acquiring information for the establishment of library requirements.

FORMS DESIGN. Necessary items of information are established, and forms are prepared for easy recording and display of this information. A Standard is written for completing each form and a sample form is filed out with information that is representative and comprehensive. These forms are pilot tested by the library analysis staff using the above Standards and samples as guides. The forms, Standards and samples are revised on the basis of pilot testing. Final versions are prepared by the Documentation Office.

AVAILABILITY. Forms, standards and samples are stored in the Documentation Office files marked FORMS and STANDARDS. They are arranged by number wherever possible. The staff may take whatever forms are needed. A "Restock Sheet" (S/B-7) is placed near the end of every supply of a form. If a staff member finds this sheet, it is to be filled out and given to the assistant in the Documentation Office. A copy of this form is attached.

REVISION. Any proposed changes to a form, a Standard or a sample is submitted to the Documentation Office. It is reviewed with the project management and if approved a revision is issued. Revised forms are indicated by a "rev." before the date in the form number. For example: The revision of the form B-4 (4-70) will have the form number B-4 (rev. 5-70).

APPROVED FORMS AND STANDARDS. The following forms and standards have been approved. Each form has a sample.

B-1	Data Element Initial Description
DS.101	Standard for Data Element Description Form
B-2	Library Organization Form Part 1 and 2
DS.102	Standard for Library Organization Form Part 1 and 2
B-3	Training Requirements
DS.103	Standard for Training Requirements Form
B-4	Input Record Description
DS.104	Standard for Input Record Description Form
B-5	Output Record Description
DS.105	Standard for Output Record Description Form

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TITLE:

B-6	Internal Record Description
DS.106	Standard for Internal Record Description Form
B-7	Processing Rules
DS.107	Standard for Processing Rules Form
B-8	Interface Description
DS.108	Instructions for Interface Description Form
B-9	Input Record Content
DS.109	Instructions for Input Record Content Form
B-10	Internal Record Content
DS.110	Standard for Internal Record Content Form
B-11	Performance Requirements
DS.111	Standard for Performance Requirements Form
B-12	Control Requirements
DS.112	Standard for Control Requirements Form
B-13	File Summary
B-14	Management Decisions
B-15	Assumptions and Concepts
B-16	Assumptions and Concepts (Technical Processing)
B-17	Management Decisions (Technical Processing)
B-18	Manual Procedure Abstract
DS.117	Standard for Manual Procedure Abstract Form
B-19	Visual Display Format

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DOCUMENTATION STANDARD DS.101

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TITLE: DATA ELEMENT INITIAL DESCRIPTION FORM (B-1)

INTRODUCTION It is difficult to answer the question, 'What is a data element?' One example is the data element representing the author of a work. Is the data element, AUTHOR, (i.e. the entire designation of the author) or is it LAST NAME, or FIRST NAME, or MIDDLE INITIAL (i.e. part of the designation). How will you know if a data element stands alone or should be "broken down" into one or more separate data elements? Further analysis is indicated if subelements could be referred to explicitly in:

- an input record
- an output record
- an internal record
- a processing rule

If real doubt exists, break it down.

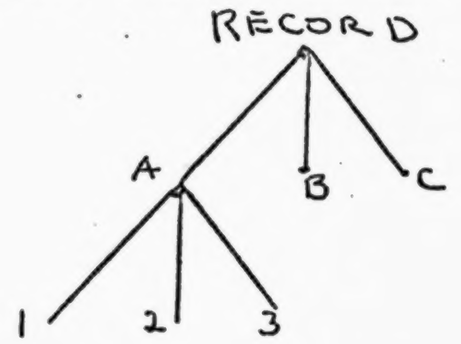
1. IDENTIFYING INFORMATION. Self-evident.

2(a). STANDARD NAME - A unique, common name used to refer to the data element. Insert a "break character" between words in STANDARD NAMES, e.g., Type--of--Payment.

2(b). MNEMONIC - A 1,2, or 3 character alpha mnemonic for the data element.

3. DESCRIPTION - Give an example of the data element clearly labeling it EXAMPLE. Follow the example with a short paragraph defining the meaning and use of the data element. Include aliases if they compete with the STANDARD NAME. Put the atypical or unusual instances under block 10. EXCEPTIONS.

4. SUPER ELEMENT(s) - If several data elements form a hierarchical structure, super element refers to the next higher element in the tree.



In the above figure, A, B, and C are the highest level data elements in a record. Since our considerations are independent of records at this time, we want to ignore that highest link. Thus, A, B, and C have no super elements; 1, 2, and 3 have A as their super element; and, A has 1, 2, and 3 as

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its subelements.

5. SUBELEMENT(S)
List the subelements, in the order in which they occur in the data element, in the left column. Identify subelements for which there is a separate descriptor sheet by placing an asterick (*) before the name. MULTIPLICITY refers to the number of times a subelement appears in a data element. Zero (0) is the lower boundary.

Where possible, give any syntax and ordering rules, delimiters, or initial and terminal characters. A syntax grammar composed of BNF productions provides a means of expressing these.

6. INTEGER, OR DECIMAL FRACTION - If the data element is an integer or decimal fraction, then provide range, number of possible values, and indicate whether distribution is random (as opposed to, say, clustered). If there exists no defined range, indicate with the word 'indet'. If number of possible values is unknown, indicate with 'indet'. USE must also be indicated, i.e., whether data element will be used mostly for computation, display, etc. If the data element will be displayed, indicate the edit picture using the COBOL conventions.

7. CHARACTER STRING - If the data element is to be treated as a character string (i.e., never to be computed with and containing no coded information) first circle either fixed or variable length. If it is the latter, estimate minimum, maximum, and average length.

8. ALPHANUMERIC CODE, OR LOGICAL POINTER - These two element types are treated together because the same questions are required of each. First indicate minimum/maximum length. If fixed in length, the two will be equal. In the case where a reasonable upper limit exists (usually when the code is two characters or less, or when it is mnemonic in nature) values vs. meanings may be listed. In cases where this becomes unrealistic, the code structure should be documented, i.e., broken down into components, and the component value vs. meanings listed. In cases where the

TITLE: DATA ELEMENT INITIAL DESCRIPTION FORM (B-1)

explanation is long and complex, references to other documents may be given.

9. CHARACTER SET. Indicate character set by circling one or more applicable abbreviations. NUM=numerical, SPEC=special characters such as punctuation, $ signs etc., UPC=upper case, LOWC=lower case, DIA=diacritical marks.

10. EXCEPTIONS - It may be the case that all descriptors mentioned above apply only to some large subset of the total set of values. List any significant exceptions to these descriptors.

1 DATA ELEMENT INITIAL DESCRIPTION FORM

AUTHOR: EAM | DATE: 4/7/70 | REVISION: | PAGE OF

SAMPLE

(a) STANDARD NAME: MAIN ENTRY | (b) MNEMONIC ME

DESCRIPTION: Used to designate the main entry functional relationship of name or title to the work.

SUPER ELEMENT (S):

SUBELEMENT (S): MULTIPLICITY AND STRUCTURE		MIN.	AVE.	MAX.
*Personal name (PN)		0	.4	1
*Title (T)		0	.3	1
*Corporate Name (CA)		0	.2	1
*Conference Name (CF)		0	.05	1
*Uniform Title Heading (UTH)		0	.05	1

Denote subelement with separate description forms by * before the name

INTEGER : OR DECIMAL FRACTION :

RANGE: #POSS.VALUES DISTRIBUTED RANDOMLY?

USE EDIT PICTURE

7 CHARACTER STRING: LENGTH (FIXED OR VARIABLE)

ESTIMATES: MAX LENGTH: MIN LENGTH: AVG. LENGTH:

8 ALPHANUMERIC CODE: | LOGICAL POINTER:

MIN LENGTH ______ | MAX LENGTH ______

VALUES VS. MEANINGS OR CODE STRUCTURE

CHARACTER SET: NUM SPEC UPC LOWC DIA ALL

0 EXCEPTIONS:

Null

SPIRES/BALLOTS PROJECT

DOCUMENTATION STANDARD DS.102

Section	
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TITLE: LIBRARY ORGANIZATION FORM (B- 2)

INTRODUCTION. During Phase B, it is necessary for library management to analyze and record personnel and organizational changes which may be necessary to implement the manual-computer system. Personnel and reorganization are sensitive areas. However, for library management to efficiently prepare for training, testing and implementation, possibilities of of change must be considered early in system development.

The Library Organization Form is a convenient, yet unstructured medium for recording changes which may be required to accomplish a particular subsystem, procedure or operation. Information on the form will be used to write the organization portion of the Requirements Document and also to prepare specific recommendations to management. The form is in two parts: personnel and organization. Guidelines for the use of each part follow.

PERSONNEL. If no organization change is required, but personnel skills or the number of people required is in need of change, use Part I. Part I is in two parts: 1. Personnel Skills and 2. Number of Personnel.

1. PERSONNEL SKILLS. Under 1, state the personnel skills required for the job. Compare these skills with current personnel and assess the amount of over or under qualification. Be sure to evaluate separately the supervisor and worker skills required. If under qualified, describe the additional skills or experience necessary. Explore the possibility of filling the deficiency through a training program. (Cross reference your suggestions to the Training Requirements Forms.) If over qualified, explain to what degree. If necessary, regard this form as project confidential and give specific names.

2. NUMBER OF PERSONNEL. Under 2, compare the number of people currently doing the job with the estimated number required. If additional personnel are needed, specify part time, full time or student employees.

ORGANIZATION. If an organizational change is required, use Part II.

CONDITION A: If a change to an already existing organizational unit is required, supply the following information:

1. What is the current organization of the job or unit in question? How many people at . what levels are involved?

TITLE: LIBRARY ORGANIZATION FORM (B- 2)

2. What is the suggestion for change? Is a change in the number or level of personnel required? If so, specify.

3. What is the reason behind the suggestion?

4. What are the implications of the change?

CONDITION B: If a new organizational unit is required, supply the following information:

1. What is the suggested organization of the new unit? Include information on the estimated numbers and levels of personnel required.

2. Are any functions now performed by a library organization unit to be taken over by this new unit. If so, describe the implications of this change.

3. What are the reasons for establishing a new unit?

LIBRARY ORGANIZATION FORM (PERSONNEL)	SYSTEM: TECHNICAL PROC.	AUTHOR: EAH	PAGE OF
	SUBSYSTEM: ACQUISITION	DATE: 4/13/70	
	PROCESS: SERIAL PAYMENT	REVISION:	
	PROCEDURE: VOUCHER PREP	OPERATION:	

I PERSONNEL:

SAMPLE

1. PERSONNEL SKILLS:

Current manual voucher preparation for serial payments will virtually be eliminated with the conversion of the serial payment file to machine readable form and the implementation of the automated technical processing system.

The new system will require (1) knowledge of how to search the Serial payment file (2) familiarity with the procedures of serial payment accounting and the contents of the file (3) knowledge of how to update the file and (4) knowledge of what the subsequent result of an update will be.

Current personnel are aware of No. 2 above. Current personnel could be trained in the use of terminal for searching, how to formulate updates, and how to interpret the results of an update.

The head of the Serials Record Division would have to be as intimately familiar with the automated serial payment system as the person responsible for day-to-day work. This could be accomplished with training.

Training Form Cross Reference: Serial Payment file searching; updating; serial payment process orientation (general); acquisition subsystem orientation (general).

2. NUMBER OF PERSONNEL:

1. F.T.E. (library assistant) is currently used for search payment processing + .30 F.T.E. supervisory time.

   The new system will require

   .75 F.T.E. (library assistant-same levels current system) + .20 F.T.E. supervisory time.

LIBRARY	SYSTEM: TECHNICAL PROCESS.	AUTHOR: EAM	PAGE
1 ORGANIZATION	SUBSYSTEM: ACQUISITION	DATE: 4/13/70	
FORM	PROCESS: ORDERING	REVISION:	OF
(ORGANIZATION)	PROCEDURE: IPF UPDATING	OPERATION:	

SAMPLE

II ORGANIZATION:

2 ORGANIZATION:

Condition B:

1. A new unit, called here Data Control, should be created to handle all IPF record creation and updates, thereby relieving any Division on the Acquisition Department from coding or keying IPF data.

The new unit would require 4 F.T.E. library assistant type terminal operators - 1 F.T.E. supervisory (library assistant - Group Supervisor).

The unit could be remote from the Department but must be in the same building.

Data Control would assume responsibility for: coding; keying; "proofing; correction; output runs; diagnostic checking; output quality control; bursting and mailing; and, connunication with Data facility and programmers as well as library staff.

2. 90% of all Order Division typing, 10% each of Dept and Exchange typing would be subsumed by Data Control. This means a clerical (library assistant) reduction of 4 F.T.E. for the Acquisition Department (p.o. typists plus 1 F.T.E. searcher).

3. Creation of Data Control would maximize control over Data entering the IPF, centralized terminal skill in one area, and provide a single communication point in case of trouble.

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TITLE: TRAINING REQUIREMENTS FORM (B-3)

1. IDENTIFYING INFORMATION. Supply the standard names for each level of analysis for which training requirements are given.

2. TRAINING TOPIC. Supply the name or a short descriptive phrase for each skill or area in which training will be required.

3(a). NUMBER OF PERSONNEL. Indicate the number of personnel who will need training.

3(b). LEVEL. Indicate the level for each type of personnel to be trained. In most cases this will be the position designation or job title.

3(c). DEVELOPMENT PHASE. Indicate the Development Phase in which the training of each level of personnel will be completed.
The Development Phases are: C. GENERAL DESIGN
D. DETAILED DESIGN
E. IMPLEMENTATION
F. INSTALLATION

EXAMPLE OF 3(a), 3(b) and 3(c).

TRAINING TOPIC	NO. OF PERSONNEL	LEVEL	PHASE
Computer terms	4	Dept. Chief	C
" "	3	Supervisor	C
" "	20	Assistant	D
" "	7	Librarian	C
Use of terminal	1	Supervisor	C
" " "	75	Assistant	D
" " "	2	Student	E
" " "	9	Librarian	C

4. EQUIPMENT REQUIRED. List any equipment required for training such as slides, texts, reference material etc.

5. COMMENTS. Make any additional comments regarding training requirements, for instance level of staff interest, availability of teaching aptitudes within the staff or willingness to study outside of working hours.

1

TRAINING REQUIREMENTS FORM	SYSTEM TECHNICAL PROCESSING	AUTHOR RAM	PAGE 1 OF 1
	SUBSYSTEM ACQUISITION	DATE 4/13/70	
	PROCESS ORDERING	REVISION	
	PROCEDURE SEARCHING	OPERATION	

SAMPLE

2 | 3

TRAINING TOPIC	(a) NUMBER OF PERSONNEL	(b) LEVEL	(c) DEVELOPMENT PHASE
IPF Searching	1	Division Chief	D
	1	Asst. Div. Chief	D
	1	Librarian	D
	4	Division Heads	D
	20	Assistants	D

4 EQUIPMENT REQUIRED: CRT or typewriter terminals. Abstracted searching manual, perhaps short reference guide.

5 COMMENTS: A test file of records must be built for these people to search. Training must take into account "search strategies." That is, with a given amount of "known information" what is the most efficient search construction.

SPIRES/BALLOTS PROJECT

DOCUMENTATION STANDARD DS.104

Section

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Date 5/14 N( )R(

TITLE: INPUT RECORD DESCRIPTION FORM (B-4)

The input records described by this form are in machine readable form. Various manual records which antedate the creation of the machine input record are not considered. This form describes the information contained in the input record, but it does not describe the format of this information. Examples of input records are: new bibliographic records captured from MARC for the IPF, update records at time of material receipt, and search requests.

1. IDENTIFYING INFORMATION - Supply standard level designations.

2a. NAME - The standard name of input record under discussion.

2b. ID NUMBER - The unique identification number for the input record (Check the master numbering list).

3. SUGGESTED INPUT DEVICE - e.g., CRT, typewriter terminal, badge reader, etc.

4. VOLUME - e.g., 3,000 records/day; 4,000 lines/hour. Use unit and period most descriptive of input activity. Prefer records for unit.

5. RECORD SIZE - Including blanks and special characters input.

6. INPUT SCHEDULE - e.g., once a day (over night); constant (8-5 M-F). This should have a logical relation to period in block 4.

7. RETENTION - (a) Period refers to length of time a record will be retained, usually in months &/or years. If it is to be kept until superceded, list the number of generations (b).

8. SOURCES - Source of the information in the input record, e.g., MARC tape; borrower ID card; Cataloging workslip. If there are multiple sources, list all and indicate which information comes from which source.

9. DESTINATION - The system, file, etc., to which this record is input, e.g., IPF file.

10. PURPOSE - The use of this record in the sytem.

11. CONDITIONS CAUSING GENERATION - A list of ALL circumstances producing input record generation, e.g., a record will be generated 1) when a patron charges a book, 2) when the catalog department calls the book back for reclassification 3) when the book is sent to repair, etc.

12. ACCEPT/REJECT CRITERIA - Conditions applying to the entire

TITLE: INPUT RECORD DESCRIPTION FORM (B-4)

record which must be met before the RECORD is accepted, e.g., you cannot discharge a book that has not been charged. Refer to processing rules whenever applicable. Accept/reject criteria and processing rules for individual data elements in the record are covered on the Input Record Content Form.

13. REJECT ACTION - Avenues of recourse when the entire record, not just a single data element, is rejected, e.g., when a search request shows that there is no entry for a call number in the Shelf List File, recheck the catalog to be sure the call number is being input correctly.

1

INPUT RECORD DESCRIPTION	SYSTEM: Technical Processin	AUTHOR: WED	PAGE
	SUBSYSTEM: Cataloging	DATE: 4/15/70	
	PROCESS: Catalog Production	REVISION:	OF
	PROCEDURE: Update	OPERATION:	

- SAMPLE -

2 (a) NAME: HOLD TAPE RECORD | (b) ID NUMBER: CAT-36

3 SUGGESTED INPUT DEVICE: TAPE

4 VOLUME - (a) AVERAGE 1,500 (number) records (unit) quarter (period)

(b) PEAK 2,500 (number) records (unit) quarter (period)

(c) GROWTH RATE NULL

5 RECORD SIZE-AVERAGE: (a) 250 (number) (characters) (b) MAXIMUM: 10,000 (number) (characters)

6 INPUT SCHEDULE: The Friday two weeks before the beginning of each academic quarter.

7 RETENTION-(a) Period: Average of 15 weeks

(b) Number of Generations Retained: 2 How long? 20 weeks

8 SOURCES: Edit tape of keypunched input from Meyer Cataloging Division

9 DESTINATION: Meyer book catalog master tape file.

10 PURPOSE: To update the book catalog master tape with the new entries cataloged during the previous quarter.

11 CONDITIONS CAUSING GENERATION: Each time a book was cataloged last quarter, a record was keypunched. These records were batched and the tape updated monthly. The hold tape is input to the catalog update when it is time to create a new catalog or supplement.

12 ACCEPT/REJECT CRITERIA:

1. Call numbers of new records must not duplicate call numbers already in catalog.
2. Call number of change and delete records must match call numbers already in Catalog.

13 REJECT ACTION:

1. Issue appropriate diagnostic
2. Pass over record, continue processing with next record.

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DOCUMENTATION STANDARD DS.105

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TITLE: OUTPUT RECORD DESCRIPTION FORM (B-5)

Use this form to describe all output records from the automated system. Follow the description form with a format of the output, showing each character position and data element.

1. IDENTIFYING INFORMATION - supply standard level designation

2a. NAME - the standard name of the output record

2b. ID NUMBER - the unique identification number for the output record. (Check the master numbering list.)

3. SUGGESTED OUTPUT MEDIUM - e.g., CRT, off-line printer

4. VOLUME - e.g., 300 records/month; 4,000 lines/hour. Use the unit and period most descriptive of output activity.

5. RECORD SIZE - e.g., 40 characters; 4 bits; 20 lines. Use unit most descriptive of output record.

6. NUMBER OF COPIES - the number of copies which must be generated.

7. OUTPUT SCHEDULE - e.g., once a day (overnight); constant (8-5 M-F). This should have a logical relation to period in block 4.

8. OUTPUT SEQUENCE - e.g., call number order; alphabetical by main entry.

9. RETENTION - (a) period refers to length of time a record will be retained, usually in months &/or years. If it is to be kept until superceded, list the number of generations to be kept (b).

10. SOURCES - The file, process, etc., from which this record is output. If there are multiple sources, list all and indicate which information comes from which source.

11. DESTINATION - the system, file, etc. to which this record goes.

12. PURPOSE - the use of this record.

13. CRITERIA FOR GENERATION - a list of all circumstances producing input generation, e.g., request to print purchase order, search of data field shows book to be overdue.

1 OUTPUT RECORD DESCRIPTION	SYSTEM: CIRCULATION SUBSYSTEM: PROCESS: CHARGING PROCEDURE	AUTHOR: WED DATE: 4/13/70 REVISION OPERATION	PAGE OF

SAMPLE

2 (a) NAME: NON-CIR. BOOK ERROR MESSAGE (b) ID NUMBER: CO-4D

3 SUGGESTED OUTPUT MEDIUM: ON-LINE PRINTER

4 VOLUME -	3	records	/	hour
(a) AVERAGE:	number	unit		period
	10	records	/	hour
(b) PEAK:	number	unit		period
	nil		/	
(c) GROWTH RATE:	number	unit		period

5 RECORD SIZE -	20	BYTES		40	BYTES
(a) AVERAGE:	number	unit	(b) MAXIMUM:	number	unit

6 NUMBER OF COPIES: 1

7 OUTPUT SCHEDULE: Produced singly at random during all library service hours - Sun: 1-11pm; M-F 8am-11pm; SAT: 8am-6pm

8 OUTPUT SEQUENCE: PRODUCED SINGLY

9 SOURCES: PROGRAM GENERATED

10 DESTINATION: PATRON AT TERMINAL

11 PURPOSE: To inform patron that the book he wishes to charge is a non-circulating item. Also, to provide information to the circulation librarian if the patron comes to him for further assistance

12 CRITERIA FOR GENERATION Patron is attempting to charge out a non-circulating book. This is determined when the program checks the circulation class in the inventory file record for the book in question

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TITLE:INTERNAL RECORD DESCRIPTION FORM (B-6)

Use this form to describe the anticipated machine readable files.

1. IDENTIFYING INFORMATION - Supply appropriate level designations.

2a. NAME - The unique name of the file.

2b. ID NUMBER - The unique identification number of the file (check the master numbering list).

3. SUGGESTED STORAGE MEDIUM: e.g., Tape, Disk, Drum, WYLBUR data set in edit format, etc.

4. ORGANIZATION: (a) SEQUENCE ORDER - e.g., Author, Call number, ID number.
(b) INDEXES - The index (i.e. entry point) files needed.

5. VOLUME - e.g., 1,000 records; 500,000 characters. Use unit most descriptive of nature of the file (records are the prefered unit whenever possible). Use period of growth most indicative of time frame in which additional storage capacity will be needed. For a constantly growing file, replace AVERAGE with PRESENT and omit peak unless there is a maximum upper limit.

6. RECORD SIZE - Including blanks and special characters input.

7. RETENTION - (a) Indicate the minimum, average and maximum life span of a typical record. (b) If one or more prior versions of the files are to be retained as backup or for an audit trail etc. specify the number of versions to be held, and the holding period. If a fixed number of volumes are rotated, i.e. write on oldest, read from youngest, then indicate 'rotate' under 'how long'. (c) If records deleted from the file are to be sent one level down in the storage hierarchy, e.g. to archival storage, or to some order processing file, then so indicate under 'disposition of record deletes'.

8. INPUTS - A list of the standard names and ID numbers of ALL input records to this file. This list should be backedup by Input Record Description Forms.

9. OUTPUTS - A list of the standard names and ID numbers of all output records from this file. This list should be backedup by Output Record Description Forms.

10. UPDATING: LEVEL - e.g., Record; Data Element; Character
MODE - e.g., Batch; On-line (submission only, or submission/update)
FREQUENCY - e.g., 1,000/day. Use period most indicative of updating cycle.

TITLE: INTERNAL RECORD DESCRIPTION FORM (B-6)

11. SEARCHING - Number refers to number of search requests. Use period most indicative of searching cycle, especially for maximum.

12. USE PERIOD - The schedule of which this file must be available for searching and updating, e.g., 8-5 M-F.

1 INTERNAL RECORD DESCRIPTION	SYSTEM: Circulation	AUTHOR: WED	PAGE OF
	SUBSYSTEM:	DATE: 4/20/70	
	PROCESS:	REVISION :	
	FILE NAME: Name & Address	FILE ID: CF-3	

-SAMPLE-

2 (a) NAME: Patron Name & Address (b) ID NUMBER: CR-3

3 SUGGESTED STORAGE MEDIUM: Disk, not permanently mounted

4 ORGANIZATION: (a) Sequence Order: N/A

(b) Indexes: Patron ID Number, Patron Name

5 VOLUME: (a) Average 15,000 number records unit / year period

(b) Peak 20,000 number records unit / year period

(c) Growth Rate + 300 number records unit / year period

6 RECORD SIZE: Average (a) 50 number characters (b) Maximum 80 number characters

7 RETENTION: (a) Record Lifespan: minimum 1 qt. average 4 year maximum 20 yrs

(b) Number of File Generations Retained: 0 How long? 0

(c) Disposition of Record Deletes: scratched

8 INPUTS:

Patron Records
Patron Update Records

9 OUTPUTS:

Patron Lists
Name & Address Records for Print Program

10 UPDATING: (a) Level Data Element

(b) Mode Batch

(c) Frequency 50 number / week period

11 SEARCHING: (a) Average 100 number / day period

(b) Maximum 300 number / day period

12 USE PERIOD: (a) Searching Overnigh print run

(b) Updating Once per week on overnight run

B-6 (4/21/70)

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TITLE: PROCESSING RULES FORM (B-7)

Present rules either in narrative form, as algorithms, as equations, or in decision table form. Equations and decision tables are the preferred form for clarity. Wherever a rule is complicated, include an example.

PROCESSING RULES	SYSTEM: Circulation	AUTHOR: Wayne Davison	PAGE OF
	SUBSYSTEM:	DATE: 4/14/70	
	PROCESS: Charging	REVISION:	
	PROCEDURE: Calculate Due Date	OPERATION:	

-SAMPLE-

RULE #																	
PP-44	Patron Class	= F	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N
		= S	N	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	N	N
		= U	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y
	Circ. Class	= 2 hr	Y	N	N	N	N	Y	N	N	N	N	Y	N	N	N	N
		= 1 da	N	Y	N	N	N	N	Y	N	N	N	N	Y	N	N	N
		= 2 wk	N	N	Y	N	N	N	N	Y	N	N	N	N	Y	N	N
		= 4 wk	N	N	N	Y	N	N	N	N	Y	N	N	N	N	Y	N
		= NC	N	N	N	N	Y	N	N	N	N	Y	N	N	N	N	Y
	Due Date	= 2 hr	X					X					X				
		= 1 da		X					X					X			
		= 2 wks			X					X					X		
		= 4 wks														X	
		= 1 yr				X					X						
		= LUO										X					
		= Spec					X										

or If Patron Class = F and Circ. Class = 2hr then Due Date = 2hr

PP-45 Order Added Copy if NUMBER OF CHARGES / NUMBER OF MONTHS = 18/12 and NUMBER OF MONTHS = 6

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TITLE: INTERFACE DESCRIPTION FORM (B-8)

1. FROM - the name of the system or organizational unit sending the record through the standard system level names where applicable.

TO - the name of the system or organizational unit receiving the record through the interface. Use standard system names where applicable.

2. RECORD NAME - the standard name of the record sent through the interface. This will be an output record from the sending unit. A complete description of this record will be found on an Output Record Description Form.

ID NUMBER - the unique identification number for the record. Check the master numbering list.

3. MEDIUM OF TRANSFER - e.g., magnetic tape, punched cards, manual form.

4. VOLUME - e.g., 1,000 records/day. Records is the preferred unit. Use the period most descriptive of the interface activity.

5. SCHEDULING - the cycling of interface activity, e.g., over night, constant (8-5, M-F).

6. SENDER CONTROLS - the edits, balances, totals, etc., maintained by the sender.

7. RECEIVER CONTROLS - edits, balances, totals, etc., maintained by the receiver.

8. RESOLUTION OF CONTROLS - necessary comparisons and checks between controls on either side of the interface.

INTERFACE DESCRIPTION	FROM Technical Processing	TO Circulation	AUTHOR Wayne Davison DATE 4/13 REVISION	PAGE OF

SAMPLE

(a) RECORD NAME

(b) ID NUMBER CI-100

3 MEDIUM OF TRANSFER Magnetic Tape

4 VOLUME - (a) AVERAGE : 50 number Records unit / Day period

(b) MAXIMUM : 200 number Records unit / Day period

(c) GROWTH RATE: Constant number unit / period

5 SCHEDULING: Daily, probably overnight batch run M-F

6 SENDER CONTROLS Total record count

7 RECEIVER CONTROLS Total record count

RESOLUTION OF CONTROLS Under Program Control

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TITLE: INPUT RECORD CONTENT FORM (B-9)

1. NAME - standard name of the input record.

2. ID NUMBER - unique identification number for the input record. Check the master numbering list.

3. DATA ELEMENT - standard name of each data element which may be present in the record.

4. SOURCE - origin of the data element for this record, e.g., borrower ID card; invoice; IPF.

5. MULTIPLICITY - how many times will this data element appear in this record. If variable, give minimum, average, and maximum.

6. EDIT RULES - ID numbers of processing rules which edit the inclusion of the data element in this record. If possible, include a brief description.

7. ACTION IF INVALID - action to be taken when edit rule stops input.

8. STORAGE RULES - ID numbers of processing rules which affect the storage of the data element in this record.

INPUT RECORD CONTENT	NAME: BOOK IDENTIFICATION	AUTHOR: WED	
	ID NUMBER: CI-30	DATE: 4/14/70	REVI

SAMPLE

DATA ELEMENT	SOURCE	MULTIPLICITY			EDIT RULES	ACTION IF INVALID
		MIN	AVE	MAX		
Call Number	Book ID label produced by Catalog Dept. from the IPF	1	1	1	PE-13	Produce error message, use exception routine with circulation attendant
Volume Designation		0	.3	2	PE-14	
Copy Designation		0	.5	1	PE-15	
Shelving Location		1	1	1	PE-16	

BOOK IDENTIFICATION	AUTHOR: WED		PAGE
BER: CI-30	DATE: 4/14/70	REVISION:	OF

SAMPLE

RCE	MULTIPLICITY			EDIT RULES	ACTION IF INVALID	STORAGE RULES
	MIN	AVE	MAX			
k ID	1	1	1	PE-13	Produce error message, use manual exception routine with aid of circulation attendant	PS-25
el	0	.3	2	PE-14		PS-26
duced by	0	.5	1	PE-15		PS-27
alog t. from IPF	1	1	1	PE-16		PS-28

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TITLE: INTERNAL RECORD CONTENT (B-10)

1. NAME - standard name of the record.

2. ID NUMBER - unique identification number of the record. Check master numbering list.

3. DATA ELEMENT - standard names of all data elements stored in the record. There will be Data Element Description Sheets for each of these data elements.

4. SOURCE - document source or file source (manual or machine readable). Give I.D. number where applicable.

5. MULTIPLICITY - the number of times the data element may occur in the record.

6. ENTERED - point in the life of the record when this data element is entered.

7. UPDATE FREQUENCY - use the time unit which accurately reflects the rate of activity such as 12/w or 60/day or 200/mo or 10/yr.

-SAMPLE-

INTERNAL RECORD CONTENT	1. NAME: PATRON NAME & ADDRESS	AUTHOR: WED	PAGE
	2. ID NUMBER: CR-3	DATE: 4/21/70	
		REVISION:	OF

3 DATA ELEMENT	4 SOURCE	5 MULTIPLICITY			6 ENTERED			7 UPDATE FREQ.		
		Min	Avg.	Max.	Init.	Early	Late	Min.	Ave.	Max.
PIN - Patron ID No.	ADP File	1	1	1	X			1/y	1/qt	1/wk
PAN - Patron Name	ADP File	1	1	1	X			1/y	1/qt	1/wk
PAD - Patron Address	ADP File	1	1	1	X			1/y	1/qt	1/wk
SAD - Street Add.	ADP File	1	1	1	X			1/y	1/qt	1/wk
CIS - City, State	ADP File	1	1	1	X			1/y	1/qt	1/wk
ZIP - Zip Code	ADP File	1	1	1	X			1/y	1/qt	1/wk
PCL - Patron Class	ADP File	1	1	1	X			1/y	1/qt	1/wk

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DOCUMENTATION STANDARD DS.111

Section

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Date 5/5 N(X)R( )

TITLE: PERFORMANCE REQUIREMENTS FORM (B-11)

I INTRODUCTION

A method is given below for developing performance criteria for any system or system component. The source is the Management Information Systems Handbook (Matthes et al., 1968).

II OUTLINE FOR THE FORMULATION OF PERFORMANCE CRITERIA

A. REVIEW OBJECTIVES - List the objectives of the new system in order of priority.

B. DEFINE DETAILED OBJECTIVES - Determine which objectives can be quantified. Breakdown unquantifiable objectives into simpler objectives which are all or in part measurable. Continue this subdivision until ALL objectives have been broken into elements which are measurable.

e.g., dimensioned numbers: books, books per year (rates)
books cataloged in 1972
(performance)

dimensionless numbers: books cataloged in 1971 (rates)
(It may be necessary in some cases to break quantifiable objectives into simpler parts.)

C. DETERMINE METHOD OF MEASUREMENT - Specify the procedure for measuring each detailed objective. These standards will insure that all measurements made in the monitoring of performance over a period of time will be comparable.

D. PREDICT FUTURE PERFORMANCE - Estimate the values of each detailed objective for a number of years. This will display the short and long term goals for the system.

III DOCUMENTATION OF PERFORMANCE REQUIREMENTS

The Performance Requirements Form is used for collecting the output of the procedure given in Section II.

1 PERFORMANCE REQUIREMENTS	SYSTEM Tech Process	PROCEDURE Material Rec.
	SUBSYSTEM ACQUISITION	OPERATION
	PROCESS ACQUISITION	

2 3 4 5 SAMPLE

PERF. REQ. #	OBJECTIVES	MEAS N	MEAS Y	PERFORMANCE RATIOS OF CRITERIA
17	To improve control over Latin American approval books.	N		
17.1	To create and update necessary In Process File records.		Y	IPF Records updated/mo.
17.2	To allow on-line searching of In Process File records.		Y	IPF Records searched/mo.
17.3	To print (and distribute) working documents within one day after generation.	N		
17.31	To print catalog data slips		Y	No. of slips printed/day
17.32	To print spine labels		Y	No. of labels printed/day
17.33	To print circulation book identifications		Y	No. of book identifications printed/day
17.34	To print vouchers		Y	No. of vouchers printed/day
17.35	To print catalog cards		Y	No. of cards printed/day

Process	PROCEDURE Material Rec.	AUTHOR D.R. Martin	PAGE
CQUISITION	OPERATION	DATE 4/13/70	
QUISITION		REVISION	OF

SAMPLE

	4		5	6					
	MEAS		PERFORMANCE RATIOS OF CRITERIA	PERFORMANCE PREDICTIONS					
	N	Y		BASE	1972	1973	1974	1975	
Latin	N			*	[5% Growth Rate Assumed]				
essary		Y	IPF Records updated/mo.	2000	2100	2200	2300	2400	
ng of		Y	IPF Records searched/mo.	100	105	110	115	120	
) one	N								
ips		Y	No. of slips printed/day	100	105	110	115	120	
		Y	No. of labels printed/day	100	105	110	115	120	
k		Y	No. of book identifications printed/day	50	53	55	58	60	
		Y	No. of vouchers printed/day	25	26	28	29	30	
		Y	No. of cards printed/day	1000	1050	1100	1150	1200	

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Section	
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TITLE: CONTROL REQUIREMENTS FORM (B-12)

I. INTRODUCTION

This documentation standard provides a form for specifying control procedures at any system level. A system control procedure must contain at minimum the three steps:

A. MEASUREMENT - Some quantifiable aspect of the system is measured.

B. COMPARISON - Thé measured quantity is compared to a standard value.

C. ACTION - An action is taken which is appropriate to to the result of the comparison.

For example, it has been decided to monitor any change in the balance of the on-line Book Fund File. One control point selected is in the ordering process within the Acquisition Subsystem. Here, changes in fund balances occur when the funds are encumbered for book purchases. The steps in the control procedure are:

A. (Measurement) The balance in a selected book fund is increased by the purchase price of a book just ordered.

B. (Comparison) The new balance is compared to the amount budgeted for that fund at the beginning of the fiscal year.

C. (Action) If the new balance is less than the budgeted amount, no action is taken. But, if the new balance is equal to, or exceeds the budgeted quantity, a warning message is generated and displayed on the Acquisition Department Daily Operations Report. On the following day, the exhausted book fund is closed, and alternative funds are chosen for subsequent purchasing activity.

The Control Requirements Form, shown on the next page, will aid the initial collection of similar control procedure data. The example described above has been entered to illustrate its use. Further instructions for completion of this form are given in Section II.

The form is intended to be general and may be used to describe: independent controls at isolated points in the system, networks of interdependent controls which interlock control points within or across system levels, or the elements of control networks which may be elevated to system status e.g., cost accounting controls ===> cost accounting system; performance controls + statistics ==> management information system. However, MAJOR system controls and control networks should also appear as entries in the Assumptions and Concepts List.

A useful summary of types of controls and a checklist of common batch-processing control techniques can be found in Chapter 6-5 of Hartman et al., MANAGEMENT INFORMATION SYSTEMS HANDBOOK (1968)

II. FORM COMPLETION INSTRUCTIONS

A. CONTROL REQUIREMENTS FORM

One copy of the form on the preceding page should be used to document EACH Control Requirement. Complete EVERY block.

B. FORM HEADER BLOCK

Fill in AUTHOR and DATE if the requirement is being specified for the first time. Supply REVISION only if a previous version is being revised.

C. REQ.NO.

Enter the unique identification number assigned to this Control Requirement.

D. CONTROL POINT

Locate the control point within the system by entering the name of the lowest system level containing the control point and those of all higher levels. If the point is a member of a control network, include this network name beside NETWORK.

E. CONTROL OBJECTIVE

Describe briefly the constraints on system activities imposed by the control.

F. QUANTITY MEASURED

Identify the data element measured during the control procedure.

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TITLE: CONTROL REQUIREMENTS FORM (B-12)

G. MEASUREMENT RULE

Supply an algorithm which gives a value for the data element name in F. Also specify the conditions which trigger execution of the algorithm.

H. COMPARISON STANDARD/RULE

Specify the comparison of the measured data element to a standard data element or value.

I. ACTION BLOCK

The comparison can produce only one of three conditions: <,=,>. However, these can be combined into 4 complementary condition sets: <,=,>; ≤,>; < ≥; =,≠. Choose a condition set and list each item under CONDITION in the form:

Data Element Name of Measured Quantity	(condition)	Value or Data Element Name of standard Quantity

For each condition listed supply:

1. ALERT PROCEDURE

A description of the data issued by the system to signal the control condition and the person, group, or system function that will be alerted.

2. CORRECTION PROCEDURE

A description of the action taken to correct the error condition or restore normal system activity.

CONTROL REQUIREMENTS

REQ. NO. 21

AUTHOR: D. R. Martin
DATE: 4/3/70
REVISION: 4/6/70

PAGE OF

SAMPLE

CONTROL POINT	CONTROL OBJECTIVE
SYSTEM LEVEL: LEVEL NAME SYSTEM: TECHNICAL PROCESSING SUBSYSTEM: ACQUISITION PROCESS: ORDERING PROCEDURE: OPERATION: NETWORK: FINANCIAL	To prevent book fund balances from exceeding fund budgets.

QUANTITY: MEASURED: Any fund balance in the Book Fund File

MEASUREMENT RULE: When a fund balance changes during encumberment calculate:
New Fund Balance = Old Fund Balance + Book Purchase Price

COMPARISON: STANDARD/RULE: New Fund Balance: Budgeted Amount for Fund

CONDITION	ALERT PROCEDURE	CORRECTION PROCEDURE
1. New Balance ≥ Budgeted Amount	Direct Fund No., Fund Balance and Budgeted Amounts, and System Msq. 43 ('Budget/ Exceeded') to acquisition daily Operations Report (Rpt. 15)	Close fund and update with alternate fund pointers on the next processing run of AQ150. Reallocate budget overrun to alternate book fund.
2. New balance < Budgeted Amount	No Action	No Action

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TITLE: MANUAL PROCEDURE ABSTRACT FORM (B-18)

1. IDENTIFYING INFORMATION - Supply standard level designations including ID.

PROCEDURE NAME - Insert name and ID for procedure being described.

ABSTRACT - A procedure abstract describes a manual procedure so that the flow of data and interfaces with related procedures are clear. It should be concise without omitting important information.

Items to be included in the procedure abstract are:

1. Purpose of procedure.
2. Personnel who carry out the procedure.
3. Documents or data used (inputs).
4. Documents or data produced (outputs).
5. Equipment used/skills required.
6. Files used.
7. Frequency of performance.

1 MANUAL PROCEDURE ABSTRACT	SYSTEM: TP	AUTHOR: EAM	PAGE 1 OF 1
	SUBSYSTEM: AQ	DATE: 7/14/70	
	PROCESS: ØRD	REVISION: 6/12/70	
	Procedure 03		

2 (A) NAME: Search Order File	(B) ID NUMBER: AQ.ØRD.03

— SAMPLE —

3 ABSTRACT:

1. PURPOSE: The Order File is searched to determine if the requested title is already in process in the Order File (i.e., has already been ordered).

2. PERSONNEL: The searching is performed by library assistants from the Order and Serial Records Divisions RDP, subject specialists and RDP Curators.

3. DOCUMENTS USED: Manual forms include: Book Requisitions (AQ.SEL.BR01), marked PW/BNB pages (AQ.SEL.PW01), telegram conformations (AQ.MOR.TC01), and out of print offers (AW,MØP.ØP01). See Input Record Description (B-4), on each of the above documents for statistics.

4. DATA PRODUCED: If the searcher finds that the title is in the Order Fill, she will pull all 3 x 5 process slips except one, leave a cross reference from that Order File Record to the In Process File Record. A new IPF record will be input (AQ.ORD.14) consisting of 1) bibliographic data, 2) old acquisition data from the order file, and 3) the new acquisition record.

   If the title is found, and the order is for the same location and in added copy is not specified, the searcher annotates the request and returns to the quester.

   If the title is not found, the searcher proceeds to AQ.ØRD.04.

5. SKILLS REQUIRED: Knowledge of searching techniques and the construction and use of the Order File.

   Equipment used: none

6. FILES USED: Order File

7. FREQUENCY OF PERFORMANCE: Daily during initial implementation. Will decline in frequency as the In Process File is used for orders.

6.4 Sample Documentation Standards

(referred to in subsection 2.5.3
and in section 2.6)

1. Naming/Numbering Conventions (DS.113)
2. System Flow Charts--Symbols and Conventions (DS.114)
3. Name Lists--System, Subsystem, Process; Files (DS.116)
4. Assumptions and Concepts (B-15) and Management Decisions (B-14) Samples
5. Level I Subsystem Flow Chart
6. Level II Process Flow Chart

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DOCUMENTATION STANDARD DS.113

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TITLE: NAMING/NUMBERING CONVENTIONS

I. SYSTEM LEVELS

```
      1 2  3   4  5
      ↓ ↓  ↓   ↓  ↓
model A.AA.AAA.NN.NN
e.g.  B.CR.ICI.02.11
```

1. SUPER-SYSTEM, a single alpha character code. The designation must be unique among all Data Facility systems. (This element is optional for internal documentation, but mandatory for external documentation.)
   e.g. B = BALLOTS

2. SYSTEM or SUBSYSTEM, a two character mnemonic. The mnenomic must be unique within the Super-System. Use either a system code or a subsystem code, but not both.
   e.g. .CR = Circulation System
   .AQ = Acquisition Subsystem

3. PROCESS, a three alpha character mnemonic. The mnemonic should be unique within the Super-System if possible. It must be unique within the System
   e.g. .ICI = Initial Check-In Process

4. PROCEDURE, a number from .01 to .99 assigned sequentially within a Process. Numbers from .01 to .09 should be written with a leading zero.
   e.g. .02 = Shelving Procedure (the second Procedure within the Initial Check-In Process

5. OPERATION, a number from .01 to .99 assigned sequentially within a Procedure. Numbers from .01 to .99 should be written with a leading zero.
   e.g. .11 = Call Number Verification Operation (the eleventh Operation within the Shelving Procedure)

When numbering a process, for example, do not use the Procedure and Operations elements. System levels below Operation are indicated by appending additional numbers, following the pattern for Procedures and Operations.

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TITLE: NAMING/NUMBERING CONVENTIONS

II. INPUT/OUTPUT

model $\overset{1}{A}.\overbrace{AA}^{2}.\overbrace{AAA}^{3}.\overbrace{AANN}^{4}$
e.g. B.CR.CHG.DS01

1. SUPER-SYSTEM (same as above)

2. SYSTEM or SUBSYSTEM (same as above)

3. PROCESS (same as above)

4. INPUT/OUTPUT, a two character alpha mnemonic followed by two digits, 01 to 99, to differentiate separate occurences of the same record format.
   e.g. A.AA.AAA.AANN
   B.AQ.ORD.IP03

   Numbers from 01 to 09 should be written with a leading zero. In all cases the label, from super-system through the I/O mnemonic, remains the same as that given to the initial occurence of the record format.

III. FILES

model $\overset{1}{A}\overset{2}{A}\overbrace{AAAA}^{3}$
e.g. BTPIPF

Unlike the identification for I/O and System Levels, the identification for Files always has a fixed length of six characters and never contains any special characters.

1. SUPER-SYSTEM (same as above)

2. SYSTEM or SUBSYSTEM (same as above except that "." is omitted)

3. FILE, a three character mnemonic. This mnemonic must be unique within the system.
   e.g. IPF = In Process File.

SPIRES/BALLOTS PROJECT

DOCUMENTATION STANDARD DS.113

Section
Page 3 of 3
Date 6/3 N( )R(x)

TITLE: NAMING/NUMBERING CONVENTIONS

IV. INTERFACES

model $\overbrace{\text{A}}^{1}.\overbrace{\text{AA}}^{2}.\overbrace{\text{AAA}}^{3}/\overbrace{\text{A}}^{1'}.\overbrace{\text{AA}}^{2'}.\overbrace{\text{AAA}}^{3'}$
e.g. B.CT.MEY/B.CR.ICI

Interfaces are named and described by the sender. The name of the interface consists of the designations of the processes (see I. above) on either side of the interface. Interfaces are described in Form B-8.

1. SUPER-SYSTEM designation (see above) of sender.

2. SYSTEM or SUBSYSTEM designation (see above) of sender.

3. PROCESS designation (see above) of sender.

1'.SUPER-SYSTEM,designation (see above) of receiver.

2'.SYSTEM or SUBSYSTEM designation (see above) of receiver.

3'.PROCESS dsignation (see above) of receiver.

V. PROCESSING RULES

Processing rules are numbered serially within processes and are recorded on Form B-7

model $\overbrace{\text{AA}}^{1}.\overbrace{\text{AAA}}^{2}.\overbrace{\text{NNN}}^{3}$
e.g. AQ.ORD.007

1. SYSTEM OR SUBSYSTEM
2. PROCESS
3. RULE NUMBER

BEFORE ACCEPTANCE, ALL PROPOSED MNEMONICS MUST BE TESTED FOR UNIQUENESS AGAINST THE CUMULATIVE MASTER LISTS, AND APPROVED BY PROJECT DOCUMENTATION.

SPIRES/BALLOTS PROJECT

DOCUMENTATION STANDARD DS.114

Section
Page
Date 5/22/70 N(X)R( )

TITLE: SYSTEM FLOWCHARTS--SYMBOLS AND CONVENTIONS

1.1 System Flowcharts

SYSTEM FLOWCHARTS show the flow of data through a processing system. In a library this is the flow of bibliographic and related data through library systems, such as acquisition and through processes, such as ordering. In general a system flowchart consists of :

ACTIVITY SYMBOLS--standard shapes which indicate a general type of activity.

ACTIVITY DESIGNATIONS--a phrase or name convention which describes activity at a point in the data flow.

MEDIA SYMBOLS--standard shapes which indicate a data storage or transmission medium (e.g. input or output).

FLOW LINES/CONNECTORS--links between symbols which indicate the type(manual or automated) and direction of flow.

COMMENTS/NOTES--written statements which are not part of the data flow, but say something about it.

1.2 Chart Levels

Two levels of system flowcharts are prepared. LEVEL I charts and LEVEL II charts.

LEVEL I. Level I charts are prepared for each current system and each proposed system. Level I charts are presented to library management and must be understandable to and understood by all library managers.

Level I charts include major processes, inputs/outputs, files and documents. These are named and numbered according to DS.113 "Naming/Numbering Conventions" on the proposed system charts only. Both manual and automated processes are shown on the proposed system charts. Manual processes shown are those affected by automation.

LEVEL II. Level II charts are prepared for the proposed systems only. They are for Department and Division Heads. Each unit manager must understand all the details of the charts covering his/her area.

Level II charts must show all inputs and outputs, all files, search requests, and terminal displays (CRT or typewriter). All inputs, output processes, procedures and files are systematically and uniquely named and numbered. (see DS.113 "Naming/Numbering Conventions".)

1.3 Rules for Preparation

PAPER. Charts are prepared on 17"x22" paper and photo reduced to 8-1/2"x11".

MARGINS. The first (i.e left-most) sheet has a 2" left margin and 1" on three sides. Continuation sheets on foldout charts are drawn with 1" margins all around.

SYMBOLS. The following symbols are standard on all system flowcharts. Standard forms(shapes) of symbols are used but not a standard size. Verbal contents of symbols are typed on sheets of self-adhesive label paper and then symbols are drawn around the typewritten information.

FLOW. System flow is always left to right and incoming flow may be shown top to bottom.

I.D. BLOCK. An identification block must be completed for each chart and placed in the lower right hand corner of the chart. It contains three parts:

REVISION SECTION. The first chart is called "Initial Version" and "0" is placed in the "Rev" box. Subsequent revisions are 1...n and a brief explanation of added or changed material is placed in the "remarks" box. The person responsible for the chart or change supplies his/her initials.

ID. The system and subsystem is identified using the standard naming conventions found in DS. 113.

TITLE. This is a prose statement of the naming code found in the ID. Current or Proposed system must be stated in the title and also the chart level. Here is an example of an ID and TITLE.

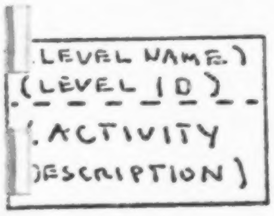
ID: B.AQ.ORD

TITLE: CURRENT AQUISITION SUBSYSTEM, ORDER PROCESS
LEVEL II

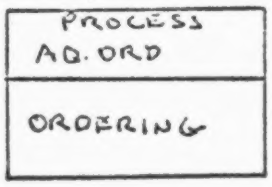
1.3 Flowchart Symbols and Interpretations

SYMBOL INTERPRETATION EXAMPLE

1.3.1 Designating System Activity

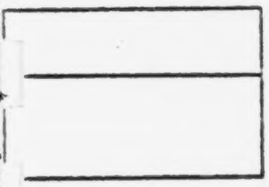


Each rectangular system activity symbol has three parts, a SYSTEM LEVEL NAME, a SYSTEM LEVEL ID, and an ACTIVITY DESCRIPTION. A level name is one or more of the following elements in the order indicated: System/Subsystem/Process/Procedure/Step. A level ID follows the the naming/numbering system in DS.113, e.g. CR.ICI--a process in the circu-

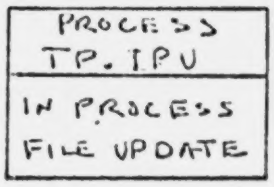


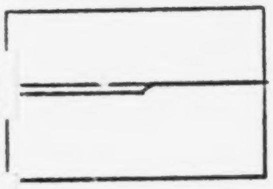
lation system. An activity description names the specific activity, e.g. "Initial Check-in".

1.3.2 Types of System Activity Symbols

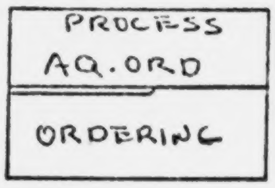


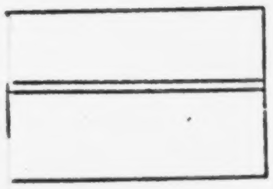
AUTOMATED
Indicates completely automated system activity. There is no manual intervention at this level or or at lower levels, (e.g. lower level procedures or operations).


PROCESS
TP.IPU
IN PROCESS
FILE UPDATE

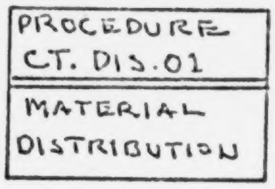


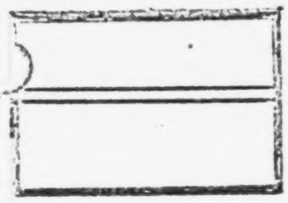
PARTIALLY AUTOMATED
System activity which is composed of both automated and manual activitie , at this or lower system levels.


PROCESS
AQ.ORD
ORDERING

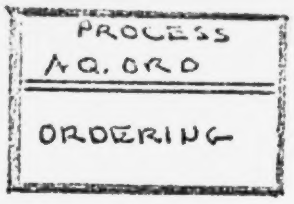


MANUAL ONLY
System activity which is composed of completely manual activities at this or lower system levels.

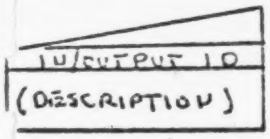

PROCEDURE
CT.DIS.01
MATERIAL
DISTRIBUTION



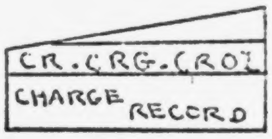
MANUAL, AFFECTED BY AUTOMATION
Manual system activity in the current library system which will be affected by automation in the proposed system.

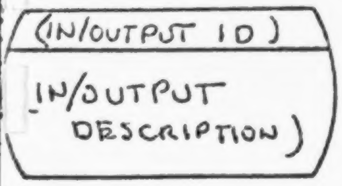

PROCESS
AQ.ORD
ORDERING

1.3.3 Media Symbols (input/output, storage)

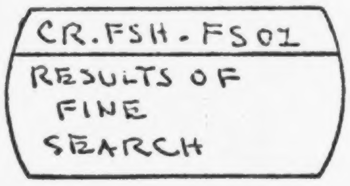

IN/OUTPUT ID
(DESCRIPTION)

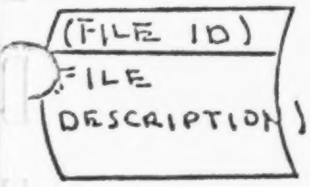
TERMINAL
Indicates date input or output at a typewriter terminal or at a machine-readable book ID reading station. Each input or output is given a unique ID.
FORMS: input, B-4, B-9
output B-5


CR.CRG.CR01
CHARGE RECORD

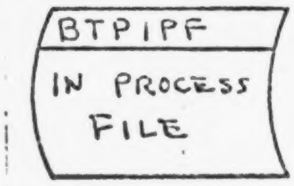

(IN/OUTPUT ID)
IN/OUTPUT
DESCRIPTION)

CRT(Cathode Ray Tube) DISPLAY
Indicates data input or output on a visual display device. Each input or output is given a unique ID.
FORMS: input, B-4, B-9
output, B-5

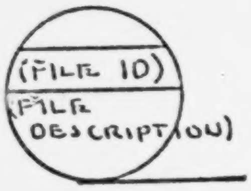

CR.FSH.FS01
RESULTS OF
FINE
SEARCH


(FILE ID)
FILE
DESCRIPTION)

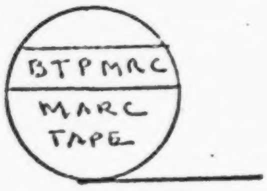
ON-LINE DISK FILE
Indicates an on-line disk file. Each file is given a uniques ID and descriptive name.
FORMS: B-6, B-10

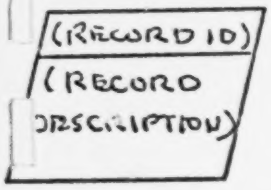

BTPIPF
IN PROCESS
FILE

SYMBOL INTERPRETATION EXAMPLE

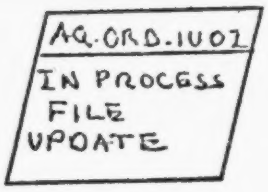

(FILE ID)
(FILE DESCRIPTION)

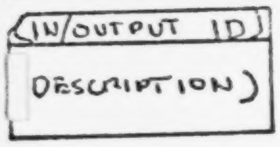
MAGNETIC TAPE FILE
Indicates a magnetic tape file, either on-line or off-line. Each file is given a unique ID and descriptive name.
FORMS: input, B-4, B-9; output, B-5
internal storage, B-6, B-10


BTPMRC
MARC TAPE

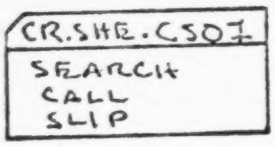

(RECORD ID)
(RECORD DESCRIPTION)

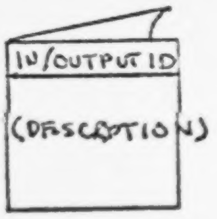
INTERNAL RECORD
A machine-readable record internal to an automated process as distinct from a Document(see below) or other hard copy representation of a record.
FORMS: B-6, B-10


AQ.ORD.IU02
IN PROCESS FILE UPDATE

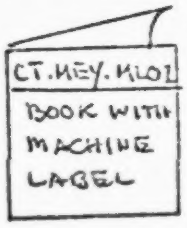

(IN/OUTPUT ID)
DESCRIPTION)

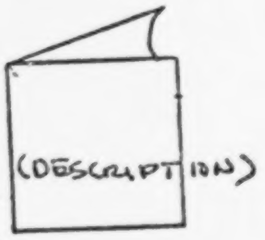
PUNCHED CARD
Indicates a punched card either as input output or storage.
FORMS: input, B-4, B-9
output, B-5


CR.SHE.CS01
SEARCH CALL SLIP

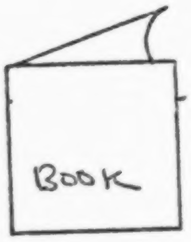

IN/OUTPUT ID
(DESCRIPTION)

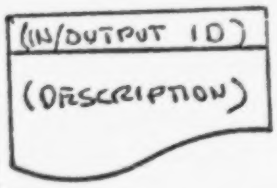
LIBRARY MATERIAL(Machine-readable)
Indicates library material such as a *book or periodical* with a machine-readable ID.
FORMS: input, B-4, B-9
output, B-5


CT.KEY.ML01
BOOK WITH MACHINE LABEL

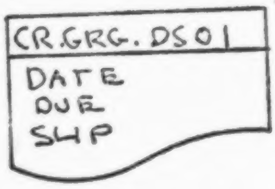

(DESCRIPTION)

LIBRARY MATERIAL (Not machine-readable)
Indicates library material such as a book or periodical without a machine-readable ID.

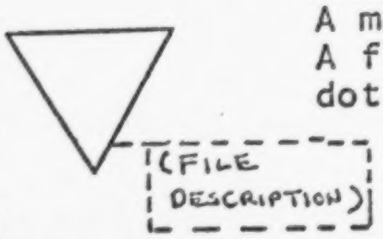


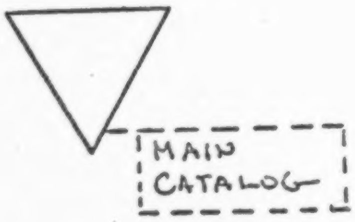

(IN/OUTPUT ID)
(DESCRIPTION)

DOCUMENT
Indicates either a manual form which is INPUT to a partially automated activity or a REPORT which is OUTPUT by an automated system activity.
FORMS: input, B-4, B-9
output, B-5


CR.GRG.DS01
DATE DUE SLIP

MANUAL FILE
A manual file of documents or records. A file descriilption is indicated in a dotted box next to the symbol.


(FILE DESCRIPTION)

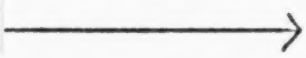

MAIN CATALOG

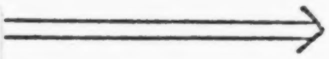
SYMBOL INTERPRETATION EXAMPLE

1.3.4 Flow Lines and Connectors

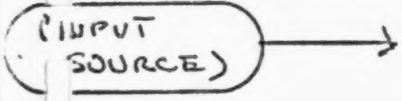
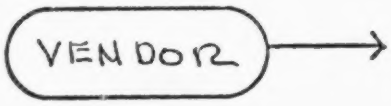
System flow is always from left to right across the page.

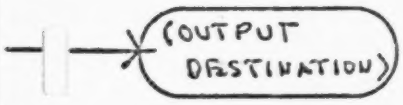
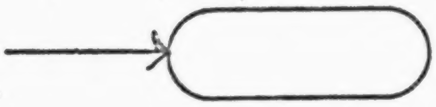
DATA FLOW


Indicates automated data flow


Indicates manual data flow

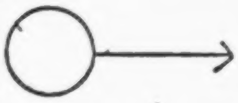
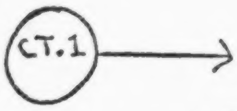
SOURCE/DESTINATION FLOW

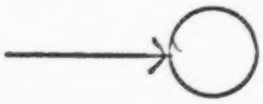
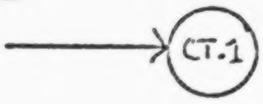

(INPUT SOURCE)
Indicates input source flowing into a system or subsystem.



(OUTPUT DESTINATION)
Indicates output destination flowing out of a system or subsystem.


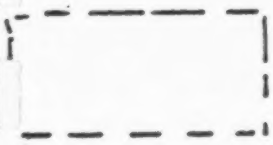
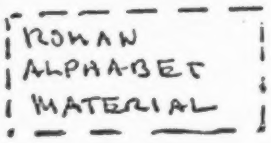
CONNECTORS

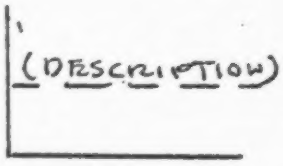
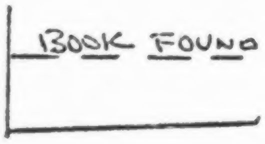
Connectors indicate entry from or exit to another part of the flowchart.


Entry Connector



Exit Connector


1.3.5 Comments and Notes


DOTTED BOX
Indicates explanation or additional commment on the system flow.

ROMAN
ALPHABET
MATERIAL


(DESCRIPTION)
DOTTED LINE
Indicates a direction description. That is, some kind of decisions has been made in the preceding system ativity and this describes one or more flows out of that activity.


SPIRES/BALLOTS PROJECT

DOCUMENTATION STANDARD DS.116

Section

Page 1 of 4

New ( ) Rev (X)

Date 6/10/70

TITLE: NAME LISTS--SYSTEM, SUBSYSTEM, PROCESS, FILES

INTRODUCTION

For analysis purposes library processing is conceptualized at six levels. These are called: System, Subsystem, Process, Procedure, Operation and, Step. The total library process organization is considered a Supersystem. During Phase B, analysis focuses primarily on activities at the level of procedures and above.

Each process, file, input/output, and interface must be uniquely named for identification purposes. This is done using the naming/numbering conventions found in DS.113. The following list is the result of applying these conventions. Additions or changes to this list are made by the Documentation Office. A revised list is issued periodically. An alphabetical list (index) to all mnemonics is found as the last list in this standard.

SUPER-SYSTEM NAMES

BALLOTS	B
SPIRES	S

SYSTEM and SUBSYSTEM NAMES

Accounting Subsystem	.AC	B.AC
Acquisition Subsystem	.AQ	B.AQ
Binding and Finishing Subsystem	.BF	B.BF
Cataloging Subsystem	.CT	B.CT
Circulation System	.CR	B.CR
Reserve Processing System	.RP	B.RP
Technical Processing System	.TP	B.TP

PROCESS NAMES

Abel Approval Payment (Voucher Prep)	.ABL	B.AC.ABL
Abel "D" Order Payment (Bill Prep)	.DBP	B.AC.DBP
Bindery Outgoing	.BOG	B.BF.BOG
Bindery Receiving	.BRE	B.BF.BRE
Book Invoice Payment	.BIP	B.AC.BIP
Cancellation	.CAN	B.AQ.CAN
Circulation Print	.PRT	B.CR.PRT
Circulation Search	.CSH	B.CR.CSH
Circulation Search Cycle	.SHC	B.CR.SHC
Charging	.CRG	B.CR.CRG
"D" Order Voucher Preparation	.DVP	B.AC.DVP
Delinquent	.DLQ	B.CR.DLQ
Discharging	.DIS	B.CR.DIS
Fine Payment	.FPT	B.CR.FPT
End Processing	.END	B.BF.END
Fine Search	.FSH	B.CR.FSH

SPIRES/BALLOTS PROJECT DOCUMENTATION STANDARD DS.116	Section Page 2 of 4 New ( ) Rev ( ) Date 6/10/70

TITLE: NAME LISTS--SYSTEM, SUBSYSTEM, PROCESS, FILES

Hold/Recall	.HLD	B.CR.HLD
In Process File Update	.IPU	B.TP.IPU
Initial Check-In	.ICI	B.CR.ICI
Lost Book Bill Identification	.BID	B.CR.BID
Lost Book Bill Update	.BUD	B.CR.BUD
Manual Cancellation	.MCN	B.AQ.MCN
Manual Exchange Request Processing	.EXC	B.AQ.EXC
Manual Material Claiming	.MMC	B.AQ.MMC
Manual Material Receipt	.MMR	B.AQ.MMR
Manual OP Procurement	.MOP	B.AQ.MOP
Manual Ordering	.MOR	B.AQ.MOR
Manual PL 480 Material Receipt	.PLR	B.AQ.PLR
MARC Data Extraction	.MRC	B.TP.MRC
MARC Processing	.MAR	B.TP.MAR
Material Claiming	.MCL	B.AQ.MCL
Meyer Data Extraction	.MEY	B.TP.MEY
Missing	.MIS	B.CR.MIS
Non Purchase Order Material Receipt	.NPO	B.AQ.NPO
Off Reserve	.OFR	B.RP.OFR
Ordering	.ORD	B.AQ.ORD
Output Printing	.OPP	B.TP.OPP
Overdue	.OVD	B.CR.OVD
Patron Search	.PSH	B.CR.PSH
P.O. Material Receipt	.POR	B.AQ.POR
Problem Processing	.PRO	B.AQ.PRO
Repair	.REP	B.BF.REP
Report Processing	.STA	B.AQ.STA
Reserve Book Listing	.RBL	B.RP.RBL
Reserve Book Processing	.RBP	B.RP.RBP
Reserve Ordering	.ROD	B.RP.ROD
Reserve Printing	.RPT	B.RP.RPT
Reserve Search	.RSH	B.RP.RSH
Selection	.SEL	B.AQ.SEL
Serial Check In	.SCI	B.AQ.SCI
Serial Payment and Credit Notation	.SER	B.AC.SER
Shelf Search	.SSH	B.CR.SSH
Voucher Check and Completion	.BVC	.B.AC.BVC

FILE NAMES

Fine File	FIN	BCRFIN
Statistics File	STS	BCRSTS
In Process File	IPF	BTPIPF
Inventory File	INV	BCRINV
MARC File	MRC	BTPMRC
Name and Address File	NAM	BCRNAM

SPIRES/BALLOTS PROJECT

DOCUMENTATION STANDARD DS.116

Section
Page 3 of 4
New ( ) Rev ( )
Date 6/10/70

TITLE: NAME LISTS--SYSTEM, SUBSYSTEM, PROCESS, FILES

ALPHABETICAL LIST OF MNEMONICS

B	BALLOTS
B.AC	Accounting Sybsystem
B.AC.ABL	Abel Approval Payment (Voucher Prep)
B.AC.BIP	Book Invoice Payment
B.AC.BVC	Voucher Check and Completion
B.AC.DBP	Abel "D" Order Payment (Bill Prep)
B.AC.DVP	"D" Order Voucher Preparation
B.AC.SER	Serial Payment and Credit Notation
B.AQ	Acquisition Subsystem
B.AQ.CAN	Cancellation Process
B.AQ.EXC	Manual Exchange Request Processing Process
B.AQ.MCN	Manual Cancellation Process
B.AQ.MMC	Manual Material Claiming Process
B.AQ.MMR	Manual Material Receipt
B.AQ.MOP	Manual OP Procurement Process
B.AQ.MOR	Manual Ordering
B.AQ.MCL	Material Claiming Process
B.AQ.NPO	Non Purchase Order Material Receipt Process
B.AQ.ORD	Ordering Process
B.AQ.PLR	Manual PL 480 Material Receipt Process
B.AQ.POR	P.O. Material Receipt Process
A.AQ.PRO	Problem Processing Process
B.AQ.SCI	Serial Check In
A.AQ.SEL	Selection Process
B.AQ.STA	Report Processing Process
B.BF	Binding and Finishing Subsystem
B.BF.BOG	Bindery Outgoing
B.BF.BRE	Bindery Receiving
B.BF.END	End Processing
B.BF.REP	Repair
B.CR	Circulation System
B.CR.BID	Lost Book Bill Identification Process
B.CR.BUD	Lost Book Bill Update Process
B.CR.CRG	Charging Process
B.CR.CSH	Circulation Search Process
B.CR.DIS	Discharging Process
B.CR.DLQ	Delinquent Processing
BCRFIN	Fine File
B.CR.FPT	Fine Payment Process
B.CR.FSH	Fine Search Process
B.CR.HLD	Hold/Recall Process
B.CR.ICI	Initial Check-In Process
BCRINV	Inventory File
B.CR.MIS	Missing Process
BCRNAM	Name and Address File
B.CR.OVD	Overdue Process
B.CR.PRT	Circulation Print Process
B.CR.PSH	Patron Search

TITLE: NAME LISTS--SYSTEM, SUBSYSTEM, PROCESS, FILES

B.CR.SHC	Circulation Search Cycle Process
B.CR.SSH	Shelf Search Process
B.CR.STS	Statistics File
B.CT	Cataloging Subsystem
B.RP	Reserve Processing System
B.RP.OFR	Off Reserve Process
B.RP.RBL	Reserve Book Listing Process
B.RP.RBP	Reserve Book Processing Process
B.RP.ROD	Reserve Ordering Process
B.RP.RPT	Reserve Printing Process
B.RP.RSH	Reserve Search Process
B.TP	Technical Processing System
BTPIPF	In Process File
B.TP.IPU	In Process File Update Process
B.TP.MAR	MARC Processing Process
B.TP.MEY	Meyer Data Extraction Process
BTPMRC	MARC File
B.TP.MRC	MARC Data Extraction Process
B.TP.OPP	Output Printing Process
S	SPIRES

ASSUMPTIONS and CONCEPTS

2 IMPOR-TANCE	3 ASSUMPTION/CONCEPT
1	The following files will be accessible for on-line sea period: 8am.-5pm., Mon.-Fri.: (1) Acquisition In Pr (2) MARC File and/or (3) Serial Payment Fi
2	Files can be updated down through the data element lev elements can be selectively maintained e.g., if one ac is changed, out of three present, the values of the ot be re-entered.
3	Data reflecting acquisition activities for separate co monograph (independent ordering schedules) will be he necessary bibliographic data in one record within the File. Each of these records will carry an unique iden ID3217. Activity data covering a particular copy will bibliographic data by suffixing the identification num lly assigned pointer (YY) in the form IDXXXXXX.YY wher example, if there is an In Process File record numbere graphic data only could be retrieved on-line by using graphic data and activity data on a copy order 3/1/70 Library through use of ID3217.1; similarly, data on th 3/4/70 by ID3217.2, and the copy for the Chemistry Dep through ID3217.3.

1

DATE: 4/14/.J
AUTHOR: EAM
SYSTEM: TECHNICAL PROCESSING-ACQUISITION

S and CONCEPTS

4

ASSUMPTION/CONCEPT	SOURCE
ill be accessible for on-line searching during the time on.-Fri.: (1) Acquisition In Process File (2) MARC File and/or MARC Index Files (3) Serial Payment File	BALLOTS I EAM
down through the data element level. Multiple data tively maintained e.g., if one added personal name entry ree present, the values of the other two do not have to	BALLOTS EAM
sition activities for separate copies of the same nt ordering schedules) will be held together with the ic data in one record within the Acquisition In Process records will carry an unique identification number e.g., a covering a particular copy will be accessible with the suffixing the identification number with a chronologica- (YY) in the form IDXXXXXX.YY where YY = 1,2,...,n. For an In Process File record numbered ID3217, the biblio- ld be retrieved on-line by using ID3217, the biblio- vity data on a copy order 3/1/70 for the Engineering f ID3217.1; similarly, data on the approval copy received nd the copy for the Chemistry Department ordered 3/10/70	EAM

ASSUMPTIONS and CONCEPTS

2 IMPORTANCE	3 ASSUMPTION/CONCEPT
4	File security will be provided to prevent unauthorized retrieval.
5	Unsuccessful MARC requests will be accumulated and re-p subsequently received for a specificed time period.
6	Data entering the Acquisition Subsystem will be edited individually and in context.
7	Performance statistics on system operation down throug be provided on management reports
8	Status alerting service will be provided for: (1) clai (2) serial invoices, and (3) invoice line item matchin tion.
9	At completion of technical processing, the In Process transferred to a historical file.

1

DATE: 4/13/70

AUTHOR: EAM

SYSTEM: TECHNICAL PROC
(ACQUISITION)

IPTIONS and CONCEPTS

4

ASSUMPTION/CONCEPT	SOURCE
ill be provided to prevent unauthorized record maintenance or	BALLOTS I EAM
RC requests will be accumulated and re-passed against MARC Files ceived for a specificed time period.	BALLOTS I EAM
he Acquisition Subsystem will be edited for validity d in context.	BALLOTS I EAM
tistics on system operation down through the process level will management reports	BALLOTS I EAM
service will be provided for: (1) claims (material and invoice, ices, and (3) invoice line item matching and voucher prepara-	EAM
f technical processing, the In Process File record will be a historical file.	BALLOTS I EAM

SYSTEM: TECHNICAL PROC	AUTHOR: EAM
SUBSYSTEM: ACQUISITION	DATE: 4/13/70

MANAGEMENT DECISIC

PRIO-RITY	IMPORT. AFTER DEC.	DECISION REQUIRED	ALTERNATIVES
1	1a	How will MARC data be stored and used? Will both the MARC File and its supporting indexes be on-line?	1) No MARC 2) MARC + INDEXES on-l 3) Indexes only on-lin etc.
2		Will MARC File records be converted to the BALLOTS input format before or after selection?	
3		An additional list of management decisions will be prepared and reported 4/10/70 in a carry-over study covering the basic acquisition system. Decisions will be requested on: support for exchange, cost accounting, fund balance files, and SDI lists.	
4		Can the interface medium with Accounts Payable be changed from printed vouchers to magnetic tape?	1) we print voucher 2) we produce magnetic, output.

MANAGEMENT DECISIONS

	ALTERNATIVES	DEC.DEADLINE (EVENT/DATE)	EFFECT OF FAILURE T DECIDE
tored and used? and its n-line?	1) No MARC 2) MARC + INDEXES on-line 3) Indexes only on-line, etc.	BEFORE END of Period I by 5/1 preferably.	No MARC t use
be converted to t before or		By 5/1	No MARC
nagement red and reported study covering ystem. Decisions support for g, fund balance		Report on Scope by 4/17 Decisions by 4/24	
n with Accounts printed vouchers	1) we print voucher 2) we produce magnetic tape output.	5/1	We print voucher

ASSUMPTIONS and CONCEPTS

2 IMPORTANCE	3 ASSUMPTION/CONCEPT
1	The following files will be accessible for on-line searching du period: Sam-5pm, Mon.-Fri.: (1) Cataloging In Process File (2) MARC File and/or MARC Index
2	All machine readable bibliographic data will be captured after technical processing. (i.e., full bibliographic data in machine will be saved in some form)
3	National and Stanford-created bibliographic data will be used t cards in filing order for the Catalog Department (scope of proc decided).
4	Spine labels and machine readable book circulation identificati created from Cataloging In Process File data.
5	Cataloging will be deferred on material where appropriate, for time, in order to chance arrival of MARC bibliographic data.

1

DATE: 4/14/.J	
AUTHOR: EAM	
SYSTEM: TECHNICAL PROCESSING-CATALOGING	

CONCEPTS

4

UMPTION/CONCEPT	SOURCE
accessible for on-line searching during the time : (1) Cataloging In Process File (2) MARC File and/or MARC Index Files	BALLOTS I EAM
graphic data will be captured after completion of , full bibliographic data in machine readable form	EAM
ed bibliographic data will be used to produce catalog he Catalog Department (scope of production to be	BALLOTS I EAM
adable book circulation identifications will be Process File data.	EAM
on material where appropriate, for a reasonable rival of MARC bibliographic data.	BALLOTS I EAM

SYSTEM:TECHNICAL PROC.	AUTHOR: EAM
SUBSYSTEM: Cataloging	DATE: 4/13/70

MANAGE

PRIORITY	IMPORT. AFTER DEC.	DECISION REQUIRED	ALTERNA
1		How will MARC data be stored and used? Will both the MARC File and its supporting indexes be on-line?	(see acq.
2		Will MARC File records be converted to the BALLOTS input format before or after selection?	(see acq.
3		An additional list of management decisions will be prepared and reported 4/10/70 in a carry-over study covering the basic cataloging system. Decisions will be requested on: authority files, on-line or book form science union catalogs, machine readable cataloging data, and cost accounting.	(see acq
4		What will be the disposition of machine readable bibliographic data? Will it be used to build an on-line catalog file or saved on a listing file. In the latter use, how would updating be accomplished?	1) save d file (no u 2) save d namic file updates 3) save d file but c

AM

/70

MANAGEMENT DECISIONS

D	ALTERNATIVES	DEC.DEADLINE (EVENT/DATE)	EFFECT OF FAILURE TO DECIDE
be stored and used? File and its be on-line?	(see acq.)		
rds be converted to ormat before or	(see acq.)		
of management dec- ared and reported over study covering g system. Decisions n: authority files, m science union eadable cataloging unting.	(see acq.)		
sposition of bliographic data? build an on-line ed on a listing r use, how would ished?	1) save data in static file (no updates) 2) save data and use dynamic file and collect updates 3) save data in static file but collect updates	By 5/1/70	Default to choice #1

SYSTEM: TECHNICAL PROC.	AUTHOR: EAM
SUBSYSTEM: Cataloging	DATE: 4/13/70

MANAGEMENT DECISI

PRIO- ITY	IMPORT. AFTER DEC.	DECISION REQUIRED	ALTERNATIVES
5		Will locally produced bibliographic data be distributed outside of Stanford in the MARC II format?	1) BALLOTS records ar convertible into M format 2) BALLOTS records ar converted into MAR format

M

70

MANAGEMENT DECISIONS

D	ALTERNATIVES	DEC.DEADLINE (EVENT/DATE)	EFFECT OF FAILURE TO DECIDE
ced bibliographic outside of C II format?	1) BALLOTS records are convertible into MARC format 2) BALLOTS records are not converted into MARC format	4/24/70	Provide Stanford BALLOTS bibliographic format only

ASSUMPTIONS and CONCEPTS

2 IMPORTANCE	3 ASSUMPTION/CONCEPT
1	The processes: Charging, Discharging, Fine Payment be on-line.
2	Machine readable book and patron identification wil
3	Charging will be performed by the patron (self-serv
4.	The Circulation System will be based on an Inventor and on a Circulation File at the Main Library.
7	There will be a file of all eligible patrons, based Administrative Data Processing.
8	Discharging will be done from the book not from a s
5	Communication between the MARC, IPF, Inventory, and
6	On-line update of all disk files.

1

DATE 4/14/70

AUTHOR WED

SYSTEM CIRCULATION

NS and CONCEPTS

4

ASSUMPTION/CONCEPT	SOURCE
rging, Discharging, Fine Payment and Hold/Recall will all	Lib. Managemen (esp Bob Golte
k and patron identification will be used.	Lib. Managemen (esp Bob Golter)
rformed by the patron (self-service).	
em will be based on an Inventory File at the Meyer Library File at the Main Library.	WED, HE
of all eligible patrons, based on files maintained by Processing.	WED
done from the book not from a separate slip.	WED
n the MARC, IPF, Inventory, and Meyer Book Catalog Files.	WED
l disk files.	WED

SYSTEM: CIRCULATION	AUTHOR: WED
SUBSYSTEM:	DATE: 4/14/70

MANAGEME

PRIO-RITY	IMPORT. AFTER DEC.	DECISION REQUIRED	ALTERNATI
1		What kind of patron identification card will be used? What will the patron identification be?	Types of pat tion: 1) machine r 2) keyed inp Patron ident 1) name 2) student n 3) social se 4) library g
2		What kind of book card will be used? How will the book be marked?	Types of book 1) machine r 2) keyed inpu Book identifi 1) call numbe 2) ID number
3		What terminal hardware will be used to collect circulation data?	1) library ci station 2) typewrite
4		What interface will we have with administrative Data Processing to produce the patron Name and Address file?	1) library ma and addres 2) carry name on cards a record
5		Will the circulation system at Meyer Library be based on an Inventory File?	abandon inven for Meyer and tion files at
6	NA	Must the validity of borrower card be checked against the Name and Address File each time the card is used?	

D
4/70

MANAGEMENT DECISIONS

	ALTERNATIVES	DEC. DEADLINE (EVENT/DATE)	EFFECT OF FAILURE TO DECIDE
identification card will the patron	Types of patron identification: 1) machine readable card 2) keyed input Patron identification data: 1) name 2) student number 3) social security number 4) library generated number	5/1/70	requirement phase canno be complete
rd will be used? marked?	Types of book identification 1) machine readable label 2) keyed input Book identification data: 1) call number 2) ID number	5/1/70	requirement phase canno be complete
re will be used to data?	1) library circulation station 2) typewriter terminal	5/1/70	requirement phase canno be complete
we have with Processing to ame and Address	1) library maintains name and address file. 2) carry name and address on cards and in inventory record	4/24/70	requirement phase canno be complete
system at Meyer an Inventory File?	abandon inventory concept for Meyer and use circulation files at all points	4/15/70	requirement phase canno be complete
borrower card he Name and Address ard is used?		5/8/70	validity check will be implemen ed.

ASSUMPTIONS and CONCEPTS

2	3
IMPORTANCE	ASSUMPTION/CONCEPT
1	There will be on-line, interactive searching of t bases.
2	The Meyer Library will use an Inventory File as i base, other libraries will use a Reserve History
5	The Reserve Processing System will print all form procedures.
3	On-line update of all disk files.
4	Communication between the MARC, IPF, Inventory, a

1

DATE: 4/14/70

AUTHOR: WED

SYSTEM: RESERVE PROC.

nd CONCEPTS

4

ASSUMPTION/CONCEPT	SOURCE
nteractive searching of the Reserve Processing data	Lib Management (esp Guy DeBall)
ıse an Inventory File as its Reserve Processing data ill use a Reserve History File.	WED
System will print all forms required in manual	Lib Management
isk files.	WED
he MARC, IPF, Inventory, and Meyer Book Catalog Files	WED

PA 1

SYSTEM: RESERVE PROC.
AUTHOR: WED
SUBSYSTEM:
DATE: [illegible]

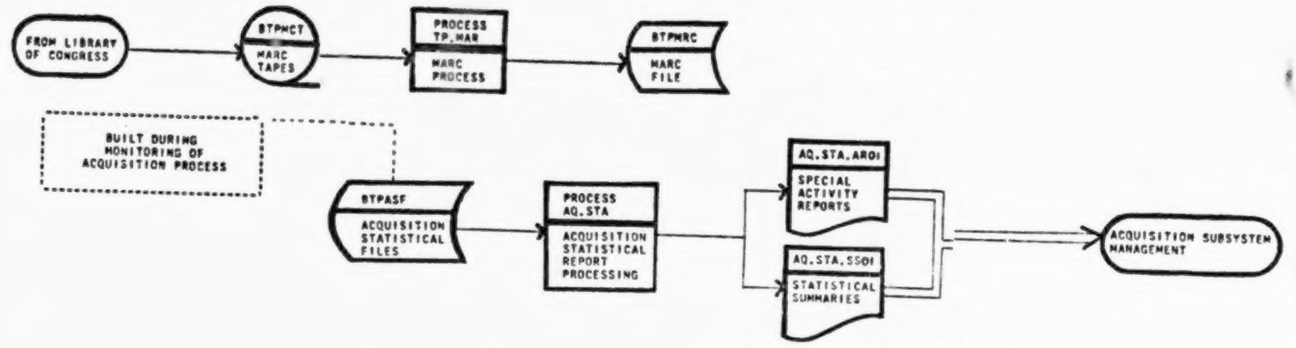
MAN

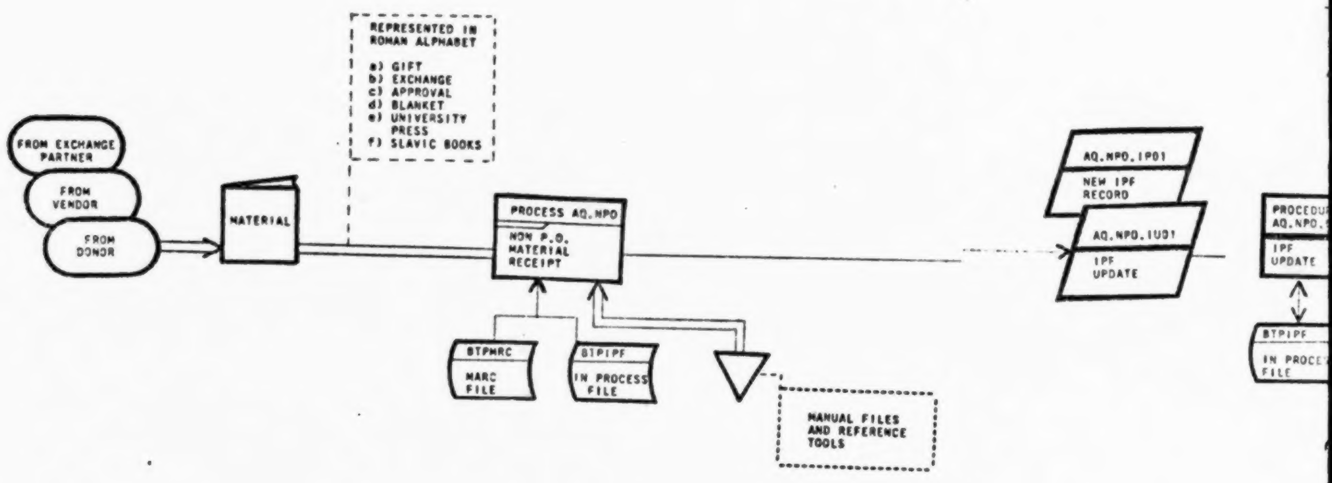
PRIO-RITY	IMPORT. AFTER DEC.	DECISION REQUIRED	ALTE
1		Will there be an Inventory File to be used in conjunction with Reserve Processing in the Meyer Library?	1) use File

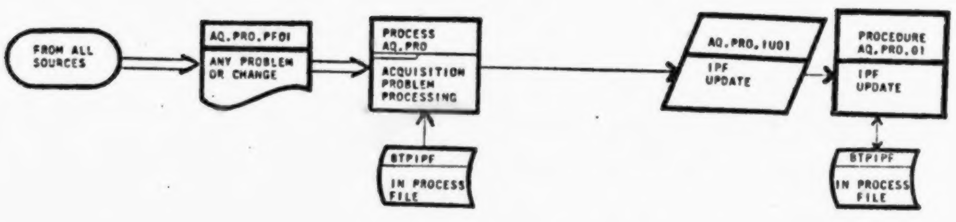
: WED

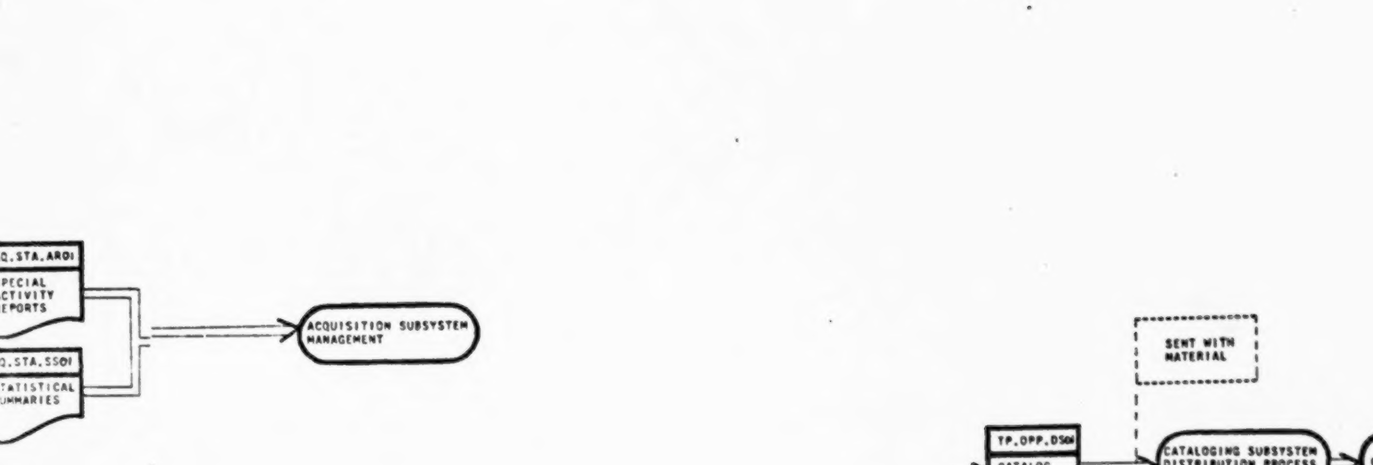
MANAGEMENT DECISIONS

IRED	ALTERNATIVES	DEC. DEADLINE (EVENT/DATE)	EFFECT OF FAILURE TO DECIDE
Inventory File to be ion with Reserve Pro- eyer Library?	1) use of a Reserve History File at all points	4/15/70	requiremen phase cann be complet


FROM LIBRARY OF CONGRESS
BTPMCT
MARC TAPES
PROCESS TP.MAR
MARC PROCESS
BTPMRC
MARC FILE
BUILT DURING MONITORING OF ACQUISITION PROCESS
BTPASF
ACQUISITION STATISTICAL FILES
PROCESS AQ.STA
ACQUISITION STATISTICAL REPORT PROCESSING
AQ.STA.AR01
SPECIAL ACTIVITY REPORTS
AQ.STA.SS01
STATISTICAL SUMMARIES
ACQUISITION SUBSYSTEM MANAGEMENT


REPRESENTED IN ROMAN ALPHABET
a) GIFT
b) EXCHANGE
c) APPROVAL
d) BLANKET
e) UNIVERSITY PRESS
f) SLAVIC BOOKS
FROM EXCHANGE PARTNER
FROM VENDOR
FROM DONOR
MATERIAL
PROCESS AQ.NPO
NON P.O. MATERIAL RECEIPT
BTPMRC
MARC FILE
BTPIPF
IN PROCESS FILE
MANUAL FILES AND REFERENCE TOOLS
AQ.NPO.IP01
NEW IPF RECORD
AQ.NPO.IU01
IPF UPDATE
IPF UPDATE
BTPIPF


FROM ALL SOURCES
AQ.PRO.PF01
ANY PROBLEM OR CHANGE
PROCESS AQ.PRO
ACQUISITION PROBLEM PROCESSING
BTPIPF
IN PROCESS FILE
AQ.PRO.IU01
IPF UPDATE
PROCEDURE AQ.PRO.01
IPF UPDATE
BTPIPF
IN PROCESS FILE


Q.STA.AR01
PECIAL CTIVITY EPORTS
Q.STA.SS01
TATISTICAL UMMARIES
ACQUISITION SUBSYSTEM MANAGEMENT
SENT WITH MATERIAL
TP.OPP.DS01
CATALOG DATA SLIP
CATALOGING SUBSYSTEM DISTRIBUTION PROCESS
CT. 1
AQ.NPO.IP01
NEW IPF RECORD
AQ.NPO.IU01
IPF UPDATE
PROCEDURE AQ.NPO.01
IPF UPDATE
BTPIPF
IN PROCESS FILE
AQ.NPO.PT01
OUTPUT PRINT RECORD
PROCESS TP.OPP
OUTPUT PRINTING
TP.OPP.NN01
NPAC NOTICE
LIBRARY OF CONGRESS
TP.OPP.RN01
REQUESTOR NOTIFICATION
TO REQUESTOR
MANUAL FILES AND REFERENCE TOOLS
7
PROCEDURE AQ.PRO.01
IPF UPDATE
BTPIPF
IN PROCESS FILE

LEVEL I SUBSYSTEM FLOW CHART

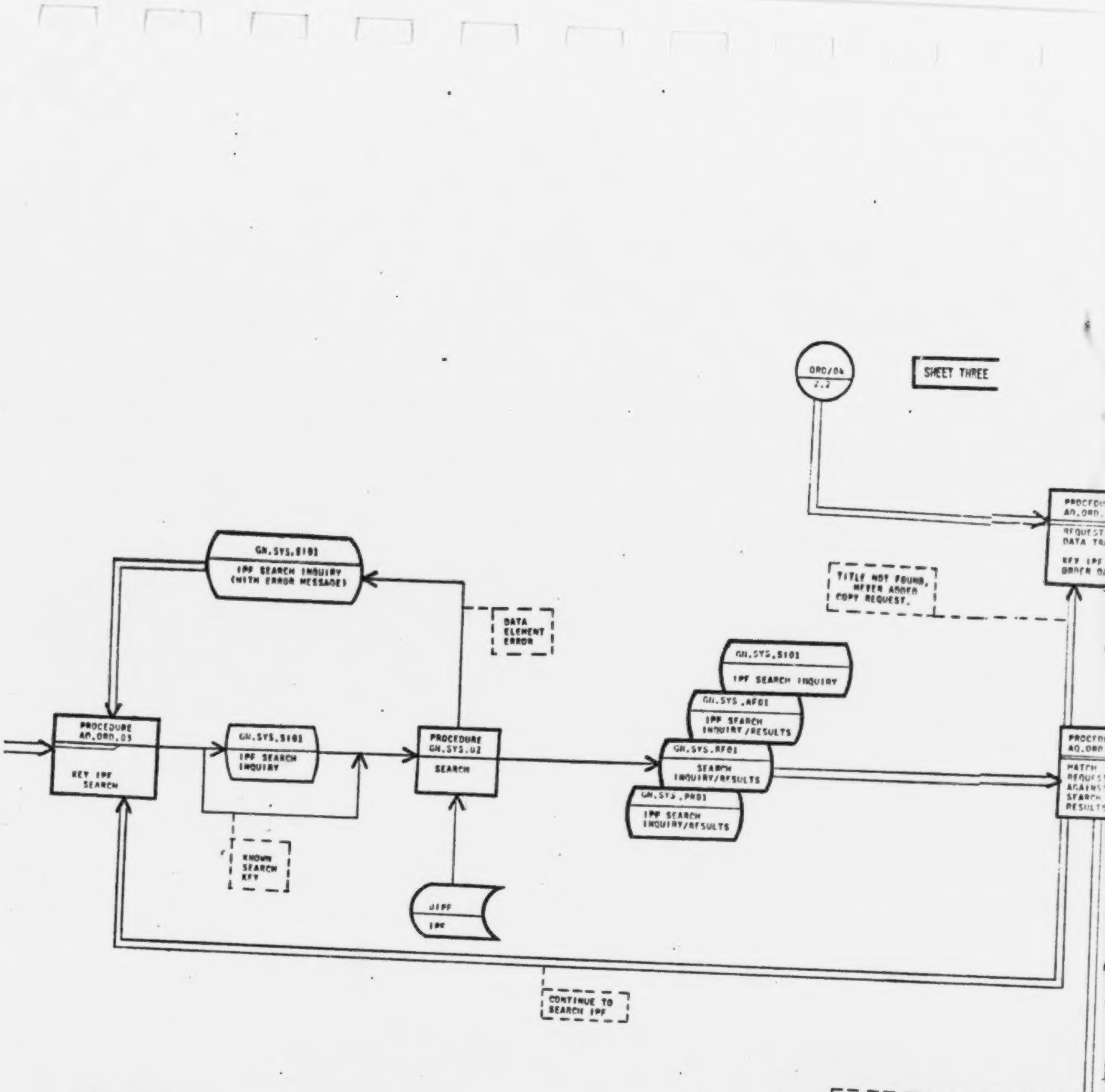
Stanford University Libraries

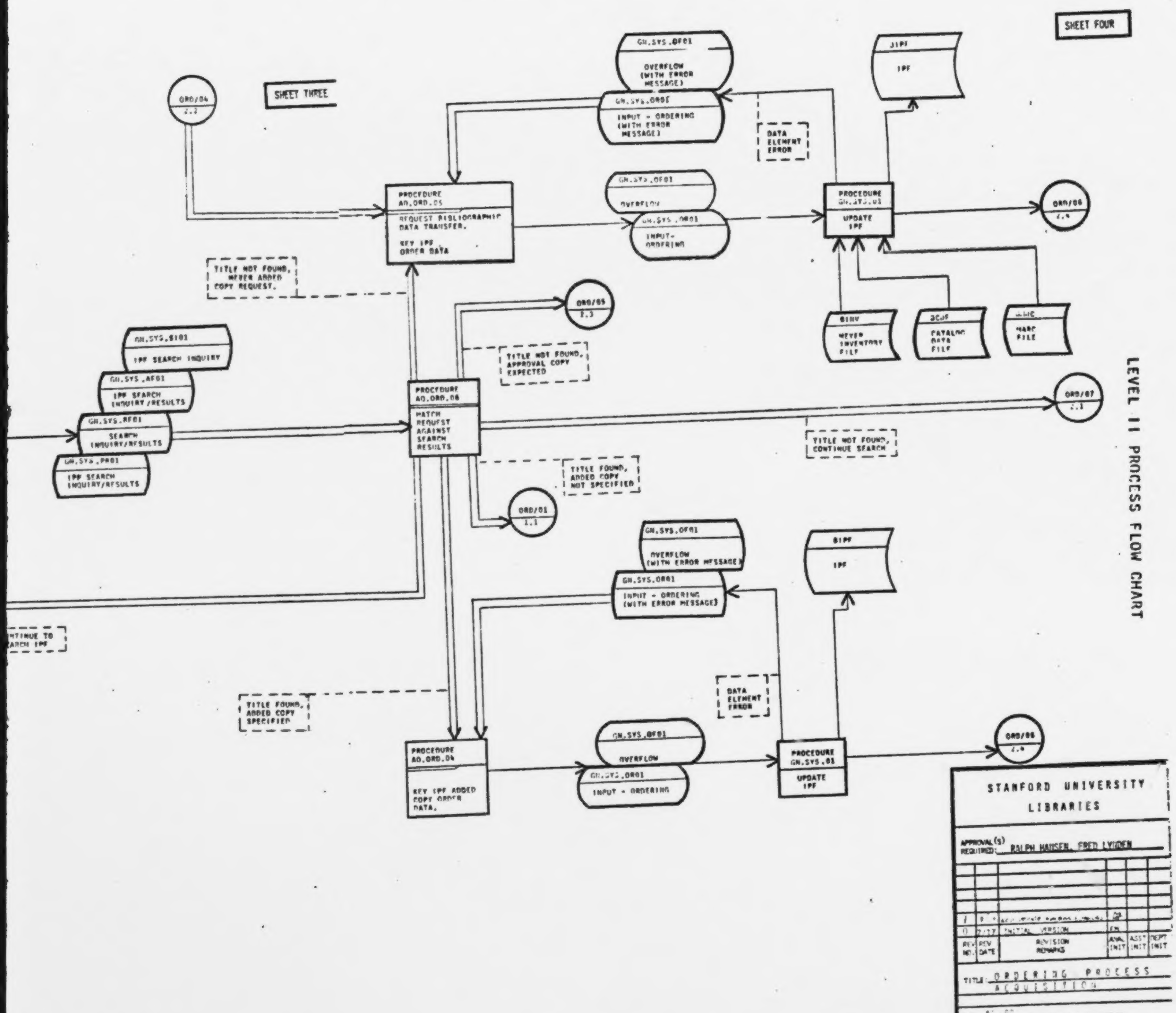
REV	DATE	REMARKS	INIT
1	5/24/70	MISC. NUMBERING CHANGES	EAM
0	5/22/70	INITIAL VERSION	EAM

ID: B.AQ

TITLE: PROPOSED ACQUISITION SUBSYSTEM LEVEL 1

FLOW CHART 1 OF 5


ORD/04
2.2
SHEET THREE
GN.SYS.SI01
IPF SEARCH INQUIRY (WITH ERROR MESSAGE)
DATA ELEMENT ERROR
PROCEDURE AO.ORD.03
KEY IPF SEARCH
GN.SYS.SI01
IPF SEARCH INQUIRY
KNOWN SEARCH KEY
PROCEDURE GN.SYS.02
SEARCH
JIPF
IPF
GN.SYS.SI01
IPF SEARCH INQUIRY
GN.SYS.AF01
IPF SEARCH INQUIRY/RESULTS
GN.SYS.RF01
SEARCH INQUIRY/RESULTS
GN.SYS.PR01
IPF SEARCH INQUIRY/RESULTS
TITLE NOT FOUND, AFTER ADDED COPY REQUEST.
PROCEDU
AO.ORD.
REQUEST
DATA TR
KEY IPF
ORDER DA
PROCED
AO.ORD
MATCH
REQUES
AGAINS
SEARCH
RESULTS
CONTINUE TO SEARCH IPF
TITLE FOUND, ADDED COPY SPECIFIED
PROCEDURE AO.ORD.04
KEY IPF ADD
COPY ORDER DATA.
TITLE FOUND, ADDED COPY NOT SPECIFIED
AO.ORD.AR01
ANNOTATED BOOK REQUISITION
ORD/01
1.1
TITLE FOUND, ADDED COPY SPECIFIED; OR TITLE NOT FOUND, TITLE WANTED.
AO.SEL.BR01
BOOK REQUISITION
ORD/02
1.1


SHEET THREE
SHEET FOUR
ORD/04
2.2
PROCEDURE
AO.ORD.05
REQUEST BIBLIOGRAPHIC DATA TRANSFER.
KEY IPF ORDER DATA
GN.SYS.OF01
OVERFLOW (WITH ERROR MESSAGE)
GN.SYS.OR01
INPUT - ORDERING (WITH ERROR MESSAGE)
GN.SYS.OF01
OVERFLOW
GN.SYS.OR01
INPUT-ORDERING
DATA ELEMENT ERROR
JIPF
IPF
PROCEDURE
GN.SYS.01
UPDATE IPF
ORD/06
2.4
BINV
NEVER INVENTORY FILE
JCUF
CATALOG DATA FILE
MARC
MARC FILE
TITLE NOT FOUND, NEVER ADDED COPY REQUEST.
ORD/05
2.3
TITLE NOT FOUND, APPROVAL COPY EXPECTED
GN.SYS.SI01
IPF SEARCH INQUIRY
GN.SYS.AF01
IPF SEARCH INQUIRY/RESULTS
GN.SYS.RF01
SEARCH INQUIRY/RESULTS
GN.SYS.PR01
IPF SEARCH INQUIRY/RESULTS
PROCEDURE
AO.ORD.06
MATCH REQUEST AGAINST SEARCH RESULTS
ORD/07
2.1
TITLE NOT FOUND, CONTINUE SEARCH
TITLE FOUND, ADDED COPY NOT SPECIFIED
ORD/01
1.1
GN.SYS.OF01
OVERFLOW (WITH ERROR MESSAGE)
GN.SYS.OR01
INPUT - ORDERING (WITH ERROR MESSAGE)
BIPF
IPF
NTINUE TO
ARCH IPF
TITLE FOUND, ADDED COPY SPECIFIED
DATA ELEMENT ERROR
PROCEDURE
AO.ORD.04
KEY IPF ADDED COPY ORDER DATA.
GN.SYS.OF01
OVERFLOW
GN.SYS.OR01
INPUT - ORDERING
PROCEDURE
GN.SYS.01
UPDATE IPF
ORD/08
2.4

LEVEL II PROCESS FLOW CHART

STANFORD UNIVERSITY
LIBRARIES

APPROVAL(S) REQUIRED: RALPH HANSEN, FRED LYDEN

REV NO.	REV DATE	REVISION REMARKS	ANAL INIT	ASST INIT	DEPT INIT
1	[illegible]	[illegible]	[illegible]		
0	2/17	INITIAL VERSION	FM		

TITLE: ORDERING PROCESS
ACQUISITION

ID [illegible]
SHEETS [illegible] PAGE ___ OF ___

6.5 Data Preparation and Data Control

(referred to in subsection 2.9.2, 2.10.3, 2.10.4, and 2.10.5)

1. Data Preparation Procedures and Forms Manual
2. Build Program Error Diagnostics
3. Automatic Job Control Language Generator
4. Vendor Address File Procedure
5. Record Update, Claim, and Cancellation Forms
6. Universal Bibliographic Data Form
7. Search Guide

DATA PREPARATION PROCEDURES AND FORMS MANUAL

The following standards for procedures and forms were established during operations of the Data Preparation Department, when it was servicing the prototype Acquisition System.

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CODING OF ACQUISITION REQUEST AND BIBLIOGRAPHIC DATA

DESCRIPTION:

The Acquisition Division receives requests for the purchase of books on SUL-25 request cards. (If the request comes in any other form, the searchers type the request onto an SUL-25 card themselves.) The back of the request card contains space for writing searching information. After the request is searched, the typist in the Acquisition Division uses the request card as the source of information from which to type a purchase order. Science approval material arrives with dealer-prepared process slips. In preparation for computer input, the information on the request card or process slip and on the LC card or proof slip is tagged with BALLOTS data element mnemonics. The initial process by which the information is prepared for computer input is called coding--acquisition and bibliographic coding.

Responsibility	Steps
1. Asst. Chief Bibliographer, Acquisition Division	1. Selects the requests, searched the day before, to be assigned a BALLOTS ID number. Gives them to Acquisition Division Secretary.
2. Acquisition Division Secretary	2. Assigns a BALLOTS ID number, taken from the Check Digit Print-out, to each request (or approval process slip). With red ink, she writes the ID number in the upper left hand corner of each request.
3. Acquisition Division Secretary	3. Xeroxes requests, as well as any attached LC cards or proof slips, onto Input Coding Sheet form. Places BALLOTS Input Coding Sheets into BALLOTS Bibliographic Pick-Up box in the Order Department.
4. Data Preparation Coder	4. At approximately 9:00 a.m., Data Preparation Coder picks up the BALLOTS Input Coding Sheets and takes them to Data Preparation Office (Rm. 335).
5. Data Preparation Coder	5. Coding Sheets are sorted into two categories--those with an LC card (or proof slip) and those without an LC card.
6. Data Preparation Coder	6. The coder analyzes each request and, using the mnemonic codes from the

	Data Element List and a red pencil, tags each element of information according to BALLOTS regulations. (See Appendix A.)
7. Coder	7. As each category is coded, the coder keeps statistics (using the Daily Processing Statistics Form) on the number of sheets coded and the amount of time taken to code each category.
8. Coder	8. As each coding sheet is completed, the coder writes her initials and the date in the lower right hand corner box.
9. Coder	9. When all the coding sheets are completed, they are given to the editor (Data Preparation Supervisor).

Equipment used: a. Xerox machine

Forms used:
a. Check Digit Print-Out
b. BALLOTS Input Coding Sheet
c. Data Element List
d. Bibliographic Coding Procedures - Appendix A
e. Daily Processing Statistics Form

6. Editor (Data Preparation Supervisor)	6. When all input coding sheets are ready for input, the editor delivers them to Data Control before 5:00 p.m.

Department: Data Preparation

Equipment used: None

Forms used:
a. BALLOTS Input Coding Sheet
b. Data Element List
c. Bibliographic Coding Procedures

EDITING OF ACQUISITION AND BIBLIOGRAPHIC CODING

DESCRIPTION:

It is important that the information in the In Process File be accurately coded. Coders cannot be expected to proofread their own work since they are prone to overlook their own errors. Therefore, it is the responsibility of the editor (Data Preparation Supervisor) to edit the input coding sheets.

Responsiblity	Steps
1. Editor (Data Preparation Supervisor)	1. Receives coding sheets from the coder for editing.
2. Editor (Data Preparation Supervisor)	2. Divides the coding sheets into two categories (as was done by the coder) --with LC cards (or proof slips) and without LC card.
3. Editor (Data Preparation Supervisor)	3. Using the Data Element List, carefully proofreads and checks to see that all coding is correct. Errors are indicated with a green pencil.
4. Editor (Data Preparation Supervisor)	4. As each coding sheet is edited, the editor writes her initials and the date in the lower right hand corner box. This is the final approval and the editor's initials signify that the coding sheet is ready for input.
5. Editor (Data Preparation Supervisor)	5. As the proofreading and editing of each category are completed, the editor keeps statistics of the number of coding sheets and the amount of time taken to edit each group on the Daily Processing Statistics Form.

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UPDATE PROCESSING

Description:

If an update is required to a record in the In Process File, the Department generating the Update (Acquisition or Catalog) prepares an Acquisition Catalog Update Report (A/C Update Report), a Cancellation Information Sheet (Cancellation Sheet), or a Claiming Information Sheet (Claim Sheet), depending on the type of update. These forms are collected and reviewed daily by Data Preparation before going to Data Control. (Note: "Update Sheets" is the term used to include all three types above.)

Responsibility	Steps
Daily	
1. Data Preparation Supervisor	1. Picks up all Update Sheets each morning from designated boxes in the Catalog and Acquisition Departments.
2. Data Preparation Supervisor	2. Counts the number of Update Sheets received from the Catalog Department and records this number on the Update Statistics Sheet.
3. Data Preparation Supervisor	3. Counts the exact number of Update Sheets received from the Acquisition Department and records this number on the Update Statistics Sheet.
4. Data Preparation Supervisor	4. Records the number of Cancellation and Claim Sheets received on the Update Statistics Sheets.
5. Data Preparation Supervisor	5. Figures the total number of Update Sheets (by adding numbers from Acquisition and Cataloging) and records this number on the Update Statistics Sheets.
6. Data Preparation Supervisor	6. Checks the A/C Update Reports to be sure each has an identification number and to see that the action requested on each sheet is clear. a. If the desired action is not clear, goes to the person whose initials are written at the bottom and finds out exactly what action was intended.

	Corrects or clarifies the A/C Update Report.
7 Data Preparation Supervisor	7. Looks over the Cancellation and Claim Sheets in the same manner, with one additional checkpoint--the vendor identification number.
8. Data Preparation Supervisor	8. Gives all Update Sheets to the Data Control Supervisor immediately.
Weekly	
1. Data Preparation Supervisor	1. Figures the weekly totals on the Update Statistics Sheet.
Monthly	
1. Data Preparation Supervisor	1. Figures the monthly totals on the Update Statistics Sheet.

Equipment used: None

Forms used:
a. Acquisition/Catalog Update Report
b. Cancellation Information Sheet
c. Claiming Information Sheet
d. Update Statistics Sheet

BALLOTS INPUT CODING SHEET

Purpose:

The BALLOTS Input Coding Sheet is the medium for transmitting acquisition and bibliographic information to Data Preparation in such a way as to facilitate the classification and tagging (coding) of the data with BALLOTS data element mnemonics. Data Control receives the completed Input Coding Sheet as the source document for computer input (using WYLBUR) and proofreading.

Use by Data Preparation

1. The layout of the Input Coding Sheet explicitly categorizes data by type: SUL-25 Request (Area A); LC Card (Area B); Control (Area C); Bibliographic Description (Area D); and Holdings (Area E). Consequently its use is determined by stringent rules. Following is a sample of a blank coding sheet. The SUL-25 Request card is xeroxed onto Area A; if available the LC card (or proofslip) is xeroxed onto Area B.

   a. SUL-25 Data: The acquisition data (and bibliographic information if no LC Card is present) is coded using the preprinted mnemonics. A red line is drawn from the printed mnemonics to the first character of the data.

   b. LC Data: The bibliographic information on LC cards is not consistently present and therefore the mnemonics must be supplied by the coder. The blank spaces on both sides of Area B are provided for this purpose. Lines are drawn directly from the mnemonics to the first character of the data.

   c. Control Data: The first column on the left containing preprinted mnemonic tags is used to code acquisition control information such as what notices are needed or what is ordered. Only pertinent information is supplied.

   d. Bibliographic description data: The second column on the left containing preprinted mnemonic tags is used to explicitly code information which is implicit on the LC card such as language of the text and country of publication. These data are supplied only when an LC card is present.

   e. Holdings Data: Coders supply holdings data for Abel approval material only.

Use by Data Control

1. The Input Coding Sheet is used as the source document for input of acquisition and bibliographic data.

    a. The layout of the form allows the terminal operator to easily follow the flow of mnemonics---from left to right and down each column. The lines drawn from the tag to the data indicate exactly what to type after each mnemonic.

2. The Input Coding Sheet is also used as the source document to proofread the data after it has been input and listed at the terminal.

3. The Coding Sheet is filed in ID number sequence for future reference.

CONTROL

EGIN:

RO

OR

RI

AC

O

NI

LT

ⓒ

ES

DD

STA

NK

ORD/MRI

IVE

Biblio.Descript.

TY

FR

CNT

C

Ⓓ

TR

GC

X

D

XT

PR

ID

CF,CA ,A

T

ED

PP

D

PR

BAC

SHE

Procedure-Page

Ⓐ

LC CARD

Ⓑ

VSP

RT

PUX

SSI, S

RID , IN

RN

RAD

VCT

VID

FD - END

HOL: Holdings Data

Location	Copy Number	Volumes	Call Number	Variation	Status/Date
Hol: ;	;	;	;	;	
Hol: ;	;	Ⓔ ;	;	;	
Hol: ;	;	;	;	;	
Hol: ;	;	;	;	;	
Hol: ;	;	;	;	;	

HN:

Additional information:

BALLOTS Input Coding Sheet

	Initials	Date
Coder:		
Editor:		
Term. Op.:		

UPDATE STATISTICS SHEET

Purpose:

To count the number of updates received daily from the Catalog and Acquisition Divisions and to figure the weekly and monthly totals.

Use by Data Preparation

1. Update sheets are divided into 4 categories: catalog, acquisitions, cancellations, claims. The Data Preparation Supervisor records the number of update sheets by category daily and calculates the total.

2. Summary totals are calculated weekly and monthly.

3. Summary statistics form the basis of the Supervisors monthly report to the Data Preparation/Control Coordinator.

SAMPLE

UPDATE STATISTICS SHEET

MONTHLY PERIOD OF September, 1969

DATE	Number from Cataloging	Number from Acquisition	Number of Cancellations	Number of Claims	Total Daily	
9/1 *	–	–	–	–	–	
9/2	4	34	1	–	38	
9/3	2	6	2	–	8	
9/4	2	11	0	–	13	
9/5	0	73	0	–	73	
	(8)	(124)	(3)	(–)	(132)	Weekly Totals
9/8	11	22	0	–	33	
9/9	2	33	0	–	35	
9/10	6	47	4	–	53	
9/11	11	25	2	–	36	
9/12	2	16	1	–	18	
	(32)	(143)	(7)	(–)	(175)	Weekly Totals
9/15	7	22	1	–	29	
9/16	7	30	4	–	37	
9/17	5	9	2	–	14	
9/18	0	45	0	–	45	
9/19	5	4	2	–	9	
	(24)	(110)	(9)	(–)	(134)	Weekly Totals
9/22	10	42	2	–	52	
9/23	2	7	0	–	9	
9/24	0	26	2	–	26	
9/25	11	82	2	–	93	
9/26	1	9	1	–	10	
	(24)	(166)	(7)	(–)	(190)	Weekly Totals

* Labor Day Holiday

DAILY PROCESSING STATISTICS

Purpose:

To record the number of coding sheets received daily and the amount of time taken to code and to edit the coding sheets. The sheets are divided into two categories--those with an LC card and those without an LC card; and the amount of time taken to code each category is computed separately.

Use by Data Preparation

1. On Monday, the dates for the week and the function--coding or editing--must be written at the top of the sheet.

2. Each day, the number of items for each category (no LC Card--English; with LC card--English; with LC card--non-English; and no LC Card--non-English) is counted and written in the appropriate box (see following sample).

3. The coder (or editor) must write the starting time and ending time for each category as each is done.

4. When all coding sheets are completed, she will fill in the Total Minutes and initial (since different people are responsible for coding on different days).

WEEK: 10/13 - 10/17/69 FUNCTION Editing

NO L.C. CARD - ENGLISH

	# of Items	Start	End	Total Min.	Initials
Mon.	32	2:11	3:50	41	CK
Tues.	41	2:50	3:22	32	CK
Wed.	29	1:10	1:20	10	CK
Thurs.	48	1:20	2:05	45	CK
Fri.	32	4:03	4:30	27	CK
TOTAL	182			155	

WITH L.C. CARD - ENGLISH

	# of Items	Start	End	Total Min.	Initia
Mon.	5	2:02	2:10	8	CK
Tues.	6	4:55	4:00	4	CK
Wed.	3	1:21	1:24	3	CK
Thurs.	17	2:06	2:22	16	CK
Fri.	16	4:32	4:48	16	CK
TOTAL	47			47	

WITH L.C. CARD - NON-ENGLISH

	# of Items	Start	End	Total Min.	Initials
Mon.					
Tues.	5	4:00	4:05	5	CK
Wed.	1	1:24	1:25	1	CK
Thurs.	3	2:22	2:30	8	CK
Fri.	4	4:49	4:54	5	CK
TOTAL	13			19	

NO L.C. CARD - NON-ENGLISH

	# of Items	Start	End	Total Min.	Initial
Mon.					
Tues.	7	4:06	4:16	10	CK
Wed.	5	1:25	1:29	4	CK
Thurs.	1	1:18	1:19	1	CK
Fri.	2	4:55	4:56	1	CK
TOTAL	15			16	

MONTHLY PROCESSING SUMMARY STATISTICS

Purpose:

To summarize on one sheet the statistics from the Daily Processing Statistics Sheet, and to figure the average minutes per item needed to process a coding sheet.

Use by Data Preparation

1. Statistics are kept on this form in the same way for coding and editing in the Data Preparation Department as they are for inputting and proofing in the Data Control Department. Therefore, the department and function must always be written in the upper right-hand corner.

2. Coding sheets with an LC card (or proof slip) and coding sheets without an LC card (or proofslip) are tallied separately.

3. The figures are transferred from the Daily Processing Statistics Sheet once a month. The totals are then calculated so that the Total Time can be divided by the No. of Items in order to derive the Average Minutes per Item (see following sample).

4. There is room for two months' worth of statistics on one form.

SAMPLE

MONTHLY PROCESSING
SUMMARY STATISTICS

DEPARTMENT Data Preparation
FUNCTION Coding

MONTH	WEEK (Dates)	NO. OF ITEMS	TOTAL TIME	AVERAGE MINS/ITEM
Sept.	9/1* - 9/5/69	32	189	
With L.C.	9/8 - 9/12	37	120	
	9/15 - 9/19	69	254	
	9/22 - 9/26	60	184	
	9/29 - 30 (2days)	53	299	
	TOTAL	(251)	(1046)	4.2
Sept.	9/1* - 9/5	67	134	
Without L.C.	9/8 - 9/12	184	381	
	9/15 - 9/19	125	248	
	9/22 - 9/26	147	240	
	9/29 - 30 (2 days)	45	70	
	TOTAL	(568)	(1073)	1.9
Oct.				
With L.C.				
	TOTAL			
Oct.				
Without L.C				
	TOTAL			
	TOTAL			

* Sept. 1st was Labor Day.

A ACQUISITION AND BIBLIOGRAPHIC CODING PROCEDURES

Introduction

Use this guide as a supplement to the Data Element list. The guide is geared to the coding sheet and is divided into two segments. Part A discusses the Acquisition Control and bibliographic data to be tagged on the Input Coding Sheet. Control data elements apply to all material. Bibliographic data on the SUL-25 request slip or dealer-supplied process slip is coded if an LC Card was not found during Acquisition searching. If an LC Card or proofslip is found and xeroxed onto the coding sheet, bibliographic data is coded from that. LC bibliographic coding is covered in Part B.

A. Acquisition Control and Bibliographic Data

1. PRO - The most common types of procurement are: regular purchase order (po), approval (a), and standing order (s). There are, however, other possibilities listed in the Data Element List. An approval book is easily recognized by its distinct form - the coding sheet contains a dealer-supplied process slip rather than a SUL-25 request or proof slip. All other requests will have a note written on them saying what type of procurement is desired; for example, "Standing order to begin with vol. 1 and to continue," or the word "prepayment" may follow the price. If there is no clue given on a request as to the type of procurement, then it is a regular purchase order.

2. XOR - Not currently used.

3. PRI - A priority item will have the words "RUSH" or "URGENT" written distincly somewhere on the request and must be coded as such. (See Data Element List.)

4. PAC - If "LC - O" or "LC - OX" is written on the request, code 1 after PAC.

5. PO - If any of the notes in the list shown in the Data Element List are written on the request, supply the appropriate number or numbers (multiple notes are possible) after PO.

6. RNI - Code RNI if the request carries an instruction to 'notify' the requester.

7. CLT - not currently used.

8. DES - not currently used.

9. ADD - Unless a note is written to the vendor that the book is to be mailed to an address other than Stanford, ADD is coded as 1. If a note is written, see Appendix II at the end of the Data Element List. (Note: This rarely occurs, but watch for it.)

10. STA - not currently used.

11. LNK - not currently used.

12. ORD/MRI -

a. If the request is an order of any kind, cross out 'MRI.' Next supply copy and bibliographic descriptor information as required for ORD as described in the Data Element List.

b. If the item is an approval book and has, therefore, already been received, cross out ORD. Then code the information regarding the material received as shown in the Data Element List.

13. IVR - not currently used.

14. ID - Check to be certain that the identification number is readable. It is also a good idea (before even beginning to sort the sheets into categories) to scan the coding sheets for duplicates. If the duplicate is caused by accidentally xeroxing two copies of one sheet, destroy one copy. If the duplicate is caused by accidental miss-numbering, take one copy down to the Acquisition Division secretary and ask her to assign a new number. If a coding sheet does not have a number, take it to the same secretary to have a number assigned.

Note: The following instructions refer to the preprinted mnemonics in the SUL-25 area of the coding sheet. If LC data is available and xeroxed on the coding sheet, do not code bibliographic elements from the process slip or SUL-25 unless specifically requested by Acquisition. Bibliographic elements which are coded from SUL-25 request slips even when LC data is available are PUX and SPO.

15. CF, CA, A - Conference Author, Corporate Author, and Personal Author name

a. A - Personal Author Name
1. Form: Surname, Forename, Initial, Numeration, Suffix title, Prefix title, Dates, etc.

(i.e., Churchill, Winston Leonard Spencer, Sir, 1874-1965.)

2. Punctuation: Use commas to separate sub-elements.

b. CA - Corporate Author Name
   1. Form: Name, Subordinate Unit, etc.

c. CF - Conference Author Name
   1. Form: Name, Number, Place, Date, Subordinate Heading, etc.

16. T - Title
Title is not coded in the acquisition information if LC information is available.
a. Form: Short title, Sub-Title
b. Punctuation: Insert where needed.

17. TU - Uniform Title
Although not preprinted on the coding sheet, the acquisition title can be a uniform title.

18. ED - Edition Statement
Edit out any repetition of the word, or abbreviation of, edition.

19. PP - Place; Publisher
Place and publisher must always be in that order. The correct order is sometimes reversed on approval process slip so watch for this.

Most important, always separate the place from the publisher with a semicolon (cf. PUX).

20. D - Date
See Appendix B for more information on the use of D and DS.

21. PR - Total Estimated Price
Order Department searchers should pre-code this (see Appendix D) but check to see that it is correct. If multiple prices are given, add them and code the total. The abbreviation "ea." for each, after the price, is acceptable. Price may be left blank.

22. BAC - Budget Account Code
If there is no account code given, ask Fred Lynden in the Order Department to provide one. One exception: Hopkins Marine Station requests are acceptable without a budget account code.

23. SHE - Shelving Location
Always coded. Should be pre-coded by searchers (see Appendix D). Check that the searcher has written the mnemonic code.

If multiple shelving locations are given code each location separately.

24. VSP - Message to Vendor
RUSH, for instance, is always coded as VSP. Code any other message to vendor as VSP.

25. RT - Remainder of Title Statement
Code as RT data after the subtitle and before the edition statement. An example is Edited by Theodore Smith.

26. PUX - Additional Acquisition Information
If the distributor is mentioned in the Acquisition information but is not mentioned in the LC information, it is coded as PUX. However, if acquisition information only is supplied to be coded, then the distributor is included within the code PP.

27. SSI, SPO - Series Statement, Special Series Acquisition Information

a. Use SSI to code series statement data.

b. SPO - not currently used.

28. RID, IMP - Requester Identification Number, Imprint Information.

a. RID - Use standard list of identification mnemonics for high volume requesters.

b. IMP - Use IMP to code special acquisition imprint information such as reprint data, etc.

29. RN - Requester Name
Use RN for requesters who do not have an RID mnemonic

30. RAD - not currently used.

31. VCT - Vendor Catalog Information
Use to code catalog name and item identification data.

32. VID - Vendor Identification Number
Identification number for frequently used vendors. See vendor ID list.

B. LC Bibliographic Data

I. Main Entry.

A. A Personal author name.
1. Surname, Forename, initial, Numeration, suffix title, prefix title, dates, etc.
eg. Churchill, Winston Leonard Spencer, Sir 1874-1965.
2. Punctuation: use commas to separate sub-elements.
Insert periods after initials, etc.

B. CA Corporate author name.

1. Form: Name, subordinate unit, etc.

C. CF Conference author name.

1. Form: Name, Number, place, date, subordinate headings, etc.

D. T Title.

1. Form: Short title, sub-title.
2. Punctuation: Use punctuation of original information.
3. T is singular and is used to code the established form of the title.

E. TU uniform title.

II. Body of card.

A. T Title. Includes title and sub-title.

B. RT Remainder of title statement. Includes all information occurring after the title and sub-title and before the edition statement.
eg. Edited by J.E. Jones.

C. ED Edition statement.
eg. 4th ed.
eg. Newly rev. ed.

D. PP Place/Publisher. Repeat the attribute for each separate place/publisher group. Use semicolon to separate place from publisher. Code in such a way that the first group is input first, the second, second, etc. See number 5 under General directions. Edit out semicolon between place/publisher groups and before the bracket in the following example: New York, Cobble Hill Press (distributed by Hill & Wang, 1968).

E. D Date. Cataloged statement of imprint date. If there is no date do not code D. If the imprint date is a roman numeral or some other unrecognizable date, code the date in the imprint as DS and supply a date in D.
  eg. (1968, 1969)
See also the discussion of attribute D (date) under XI. Implicit Bibliographic Description.

III. Collation.

A. PG pagination. eg. iv, 191 p. Do not code PG for an open entry.

B. ILL illustration. eg. illus., maps (part fold.)

C. SIZ size. If half size is given cross out and go to next whole number.
  eg. 24cm.

IV. Series.

A. SSI Series statement as given on order form or in series position on LC Card after collation.
  eg. iv, 196 p. 23cm. (McGraw Hill science series)
SSI is singular.

B. SNI series note as given in first note position. SNI is multiple.

C. SEI series added entry. Use to code the series added entry if that entry is in a different form from that which is indicated in SSI. This does not have to be added to the TI (tracing indicator); SEI is always considered traced.

V. Notes.

A. GN General Notes. Formal bibliographic notes of a general nature.
  eg. Stamped on t.p.: New York, Harper.
If there are more that 400 characters in GN make the note into two or more notes.

B. NC Contents Notes.
  eg. v.1. The man in the moon.-v.2. The sea. If there are more than 300 characters make the note into

two or more notes. Code in such a way that the parts of GN will fall into proper order when input.

C. BIB Bibliography Notes. Cross out bibliography.
eg. p. 31-33.

D. SBN Standard Book Number

VI. Added entries.

A. SS Subject. Each subject heading (Arabic nos.) is coded SS; SS is always considered traced.

B. Other added entries (Roman numerals)

1. Title. If the same as the title coded in the body, line out and do not code. Add the value T to the tracing indicator TI.
2. Title Added Entry. An alternative form of the T.P. title. Line out Title: Code as TA. Add value to TI.
   eg. II. Man and Ape. TI = T, TA.
3. Author-Title Added Entry. Code author and title as A, CA, or CF. If the title is to be indexed separately, also code the title as TA; Do not add TA here to TI.
   eg. III.McLuhan, Herbert Marshall, The Medium is the Massage.
4. Added Author. Code appropriately as A for personal author, CA for corporate author,, CF for conference author. Add these to TI also. If any of these is the 2d or 3d A, CA or CF code as A, CA or CF but add to TI as A2, CA2, CF3, etc.
5. Series.
   a. SEI used to code series added entry if that entry is in a different form from that which is indicated in SSI. Code SEI but do not add to TI. Cross out series.
   b. SSI in added entry is series in the same form as in series statement. SSI is not coded but is added to TI. Cross out series.

VII. LC Information.

A. LC = LC Call No. Code all call nos. except Dewey, PZ1-4 or P nos. in () or any LC No. in ( )
eg. F2258.G3 1966.

B. CRD LC Card No.

VIII. Indicator Attributes.

A. ME Main Entry Indicator. Code at bottom left of bibliographic LC Card.
   eg. ME = a (if personal author is ME)

B. TI tracing indicator. Separate sub-elements by a comma. Code at bottom right of bibliographic LC card.
   eg. TI = a2,ca,t.

IX. Implicit bibliographic description.

A. TYP type of work (see attribute list)

B. FRM form of reproduction (see attribute list)

C. CNT form of content (see attribute list)

D. CP country of publication. If U.S. leave blank (U.S. by default) The country is of the first place named in the imprint.
   eg. London, New York; Academic Press. Code EN for Eng.

E. L language
   1. Language (s) English assumed by default.
   2. Language (s) of summaries.
      eg. 1.Eng.fre;2Rus.
   3. Separate categories by semicolon.

F. TR translation.

   1. Language of the text.
   2. Language from which the text was translated.
   3. Original language if different from the language from which the text was translated.
   4. Language (s) of summaries.

G. GOV government publications indicator.

H. X index indicator. Used to indicate the work contains an index to itself.

I. D date. Must be filled in when imprint date is unrecognizable.

J. XT incomplete record. Diacritical marks not included. Check 1.

K. PRE Precataloging indicator. Always check 1 when bibliographic information from an LC card.

GENERAL DIRECTIONS

1. Edit out superfluous information.
   eg. Bibliography:

   SBN
   Roman or Arabic numerals in tracings.
   Title
   Title: (alternative title)
   (series) In tracing
   Series: SEI
   Contents

2. Always edit personal name for following:

   a. Supply periods after initials.
      eg. Jones, James B.

   b. If any other information besides name is present, name must be delimited by second comma.
      eg. Smith, John, 1900-1967.
      eg. Henry IV, King of England.
   c. Move prefix title.
      eg. Churchill, Winston Leonard Spencer, Sir 1874-1965.
   d. Author-title added entry. Supply 2d comma.
      eg. McLuhan, Herbert Marshall, The medium is the massage.

3. All like attributes must be input together. If the main entry is a (personal author) and there are two other A's (personal authors) in the added entries, they must be indicated at the top of the coding sheet as A3 so that the input operator will input all three A's at the same time.

4. Draw lines to first word of an attribute value; draw lines clearly and legibly to facilitate input.

5. For PP, GN, NC, code attribute so that the order of the information is preserved.

6. Items on card not coded: open entry in collation, price, National bibliography numbers, any bracketed information on bottom of card, Dewey call nos., PZ 1-4 or P nos. in ( ).

7. If attributes are bracketed, edit in such a way that each attribute has an initial AND final bracket.

CONTROL
CGI : SBN
RO a
OR
RI
AC
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HI
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DA
NK
HI RI LC; 3-18-69.
VR

ibilo.Descript.
XP /
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SHE — Engin.

10-10044
Engin
NWC 001
~~add ed.~~
Q175
P863
stack
1960

15X 09 080030 4
AUTHOR LC ed. Q175.P863 1968
Popper, Sir Karl Raimund, 1902-
TITLE
The logic of scientific discovery.
C-0
0-0
B4N D6

148141
L. C. NO. 68-141132

ORDER NO. B06500	PUBLISHER London; Hutchinson ~~Hutchinson, London.~~	PUB. DATE 1968		REQUESTOR SUS
ORDER DATE	EDITION 3d ed. rev.	VOLS.	COPIES 1	APPROVED
DATE RECEIVED MAR 1 3 1969	INVOICE DATE 2-21-69			FUND 30

RICHARD ABEL & CO., INC.
INDUSTRIAL CENTER BLDG.
GATE 5, ROAD MARINSHIP
SAUSALITO, CALIF. 94965

LIST PRICE	NET PRICE	SALES TAX	SELLING PRICE
2604.50-N	10.80-N	.54	11.34

ORIGINAL INVOICE

VSP
RT
PUX
SSI, SPO
RID, IMP
RN
VOD
VID

A
T
ED
PG
ILL
SBN
BIB
SS
SS
LC
mela a

— supply comma after Sir

Popper, *Sir* Karl Raimund, 1902-
The logic of scientific discovery [by] Karl R. Popper. [3d ed. (revised)] London, Hutchinson, 1968.
480 p. illus., facsim. 24 cm. ~~60/- (21/- pbk.)~~
~~SBN~~ 09-080030-4 ; 09-080031-2, pbk. (B 68-18253)
Bibliographical footnotes.

1. Science—Methodology. 2. Logic. I. ~~Title.~~

Q175.P863 1968 501'.8 68-141132

Library of Congress [13]

t

RT
PP
DS
SIZ
SBN
CRD
TI

HOL: Holdings Data

	Call Number	Location	Copy Number	Status
Hol:	LC	ENG.		
Hol:				
Hol:				
Hol:				
Hol:				

HN:

FD - END

Additional information:

Note two SBN numbers: code separately. edit out ; in between

BALLOTS Input Coding Sheet

	Initials	Date	Time Start	Time End
Acq.coding:	DUI	3-12-69	10:07	10:09
Coder:	MMW	3-18-69	1:09	1:10
Editor:	DI	[illegible]	4:05	[illegible]
Term. Op.:				
Proof:				

CONTROL

EG :

RC a

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Biblio.Descript.

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1.

ID

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CLASS NO. ID-10045

Engin
NWC 001
add ed.
620.8023
L536a
ed. 2 Engin.
Russian

LC ed. TA660.P6L4413 C-0 0-0

AUTHOR
TITLE ~~Lekhnitskii, S. G.~~

Anisotropic plates.

~~EAN DG adv~~

INVOICE NO. SF ~~150810~~

L. C. NO. ~~67-28238~~

ORDER NO. P06500 N.Y.	PUBLISHER ~~Gordon & Breach~~			PUB. DATE ~~1968~~	REQUESTOR
ORDER DATE	EDITION 2a	VOLS.	COPIES 1 -		APPROVED
DATE RECEIVED MAR 17 1969	INVOICE DATE				FUND 30

RICHARD ABEL & CO., INC.
INDUSTRIAL CENTER BLDG.
GATE 5, ROAD MARINSHIP
SAUSALITO, CALIF. 94965

ENG

LIST PRICE	NET PRICE	SALES TAX	SELLING PRICE
~~[illegible]~~	~~20.70~~	~~1.40~~	~~#21.10~~

ORIGINAL INVOICE

A

T

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GN

BIB

SS

LC

Lekhnitskii, S. G.

Anisotropic plates [by] S. G. Lekhnitskii. Translated from the second Russian edition by S. W. Tsai and T. Cheron. New York, Gordon and Breach [1968]

xvi, 534 p. illus. 24 cm.

Translation of ~~[illegible]~~ (romanized: Anizotropnye plastinki)

Includes bibliographies.

1. Plates (Engineering) ~~I. Title.~~

TA660.P6L4413 620.1'1282 67-28238

Library of Congress [5]

[illegible] a

VSP

RT /

PUX

SSI, SPO

RID, IMP

RN

VOT

VID

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t TI

HCL: Holdings Data

	Call Number	Location	Copy Number	Status
Hol:	LC	ENG		
Hol:				
Hol:				
Hol:				
Hol:				

HN:

FD - END

Additional information:

also notes: cross out non-roman characters. Input operators will input romanized form

BALLOTS Input Coding Sheet

	Initials	Date	Time Start	Time End
Acq.coding:	[illegible]	3-18-69	10:02	10:1[illegible]
Coder:	[illegible]	3-19-69	1.10	1.13
Editor:	[illegible]	3/19	1.12	[illegible]
Term. Op.:				
Proof:				

209

CONTROL

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CA

KX

D/ART 1 [illegible] 2-19-69

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Biblio.Descript.

IP /

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EN

R

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1967

RS 1

ID 1215 LC [illegible]

CF.CA .A

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SHE

Author Title	Mackie, Robert Laird, 1885- comp. ✓A book of Scottish verse; selected by R.L. Mackie. The selection revised with a new introd. by Maurice Lindsay.
Edition	2d ed.
Place	N.Y.
Publisher	~~[illegible]~~ Oxford Univ. Press ~~[illegible]~~
Date of Publication	1967
No. Vols.	xxx, 450p.
Series	(World's classics, 417)
No. Cop.	1
Price	15/
Req. by	WPA
Dept.	Craig Fund
Fund	NKD 306
Acct. No.	
Stacks	Stacks
Order From:	ADEL
Other Info.:	
Cat.:	~~[illegible] 8-5-68~~
Item:	~~p/32~~

821.08
M158
(1934)
STACK
30

VSP

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PUX

SSI, SPC

RID . IMP

RN

VCT

VID

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SS

LC

ml — a

Mackie, Robert Laird, 1885- , comp.

A book of Scottish verse; selected by R. L. Mackie. 2nd ed.; the selection revised with a new introduction by Maurice Lindsay. London, New York [etc.] Oxford U. P., 1967.

xxx, 450 p. 15 cm. (The World's classics, 417) 15/-

(B 67-20187)

1. Scottish poetry (Collections) I. Lindsay, John Maurice, 1918- II. Title.

PR8651.M25 1967 821'.008 68-74721

Library of Congress [3]

a², t

RT

ED

PP

DS

SSI

a

CRD

TI

HOL: Holdings Data

	Call Number	Location	Copy Number	Status
Hol:				
Hol:				
Hol:				
Hol:				
Hol:				

RN:

FD - END

Additional information:

A comma must separate each part of a personal name entry.

BALLOTS Input Coding Sheet

	Initials	Date	Time Start	Time End
Acq.coding:	[illegible]	[illegible]	[illegible]	[illegible]
Coder:	MUK	2-19-69	1.11	1.13
Editor:	[illegible]	[illegible]	[illegible]	[illegible]
Term. Op.:				
Proof:				

CONTROL NO.

BEGIN:

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XCR

PRI

P C

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S A

INK

CRE LC3
3-20-69

R

Biblio.Descript.

TYP /

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CP EN

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PRE 1

ID

CF,CA ,A

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PP

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ILL

SBN

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a

LC

MAO — a

Author ✓ Victoria, Queen of Gt. Brit., 1819-1901.

Title O Dearest Mama: letters between Queen Victoria and the Crown Princess of Prussia, 1861-1864, edited by Roger Fulford.

Edition

Place London

Publisher Evans Bros.

Date of Publication 1968.

No. Vols xvi, 372 p.

Series.

No. Cop. 1

Price 63/-

Req. by ~~RCP~~

Order From: FBEL

Other Info.:

Dept. Baker

Fund

Acct. No. NKD 656

Shelve stacks.

Cat.:

Item: 30

Searcher: GF

Date: 2-13-69

Victoria, Queen of Great Britain, 1819-1901.

Dearest Mama: letters between Queen Victoria and the Crown Princess of Prussia 1861-1864; edited by Roger Fulford. ~~London;~~ Evans Bros., 1968.

xvi, 372 p. 31 plates, illus., geneal. tables, ports. 23 cm. 63/-

SBN 237-44410-0 (B-68-20452)

I. Victoria, consort of Frederick III, German Emperor, 1840-1901. II. Fulford, Robert, 1902- ed. ~~III. Title.~~

DA552.D44 ~~942.081'0924~~ 72-354167

Library of Congress 69 [3]

$1^{a}a^{2}a^{3}t$

RT

PUX

SSI, SP

RID, IMP

RN

VOT

VID

RT

PP

DS

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CRD

TT

HOL: Holdings Data

	Call Number	Location	Copy Number	Status
Hol:				
Hol:				
Hol:				
Hol:				
Hol:				

RN:

FD - END

Additional information:

one-word names: supply two commas

BALLOTS Input Coding Sheet

	Initials	Date	Time Start	Time End
Acq.coding:	[illegible]	[illegible]	[illegible]	[illegible]
Coder:	[illegible]	[illegible]	[illegible]	[illegible]
Editor:	[illegible]	[illegible]	[illegible]	[illegible]
Term. Op.:				
Proof:				

CONTROL GN

CGI:
RO S
CR
RI
LC
P 2
NI
LT
DS
CD 1
PA
IX
RD, RRI (v.1-) 3-17-(?)
VR
Biblio.Descript.
YP 1
RX
NT
P
R
COV
1968
RE 1

ID 1286 | LC card BT83.R63

CF.CA A
T
ED
PP
D
PR
SHF

Author Robinson, James McConkey, 1924-

Title The beginnings of dialectic theology. Edited by James M. Robinson. ~~Vol. I and all future~~ vols. as published.

EXAMPLE

Edition	Place	Publisher
	Richmond	John Knox Press

Date of Publication	No. Vols.	Series
1968-	v.	

No. Cop.	Price
1	$12.50 ea.

Req. by EG
Dept.
Fund
Acct. No.
Shelve Stacks

Order From: Abel
Other Info.:
30
Cat.:
Item:

VSP
RT
PUX
SSI, SPC
RID, IMP
RN
VCT
VID

A
T
SIZ
GN
GN
AIB
LC
a

Robinson, James McConkey, 1924-
The beginnings of dialectic theology. Edited by James M. Robinson. Richmond, John Knox Press [1968-]
v. 24 cm. $12.50 (v. 1)
Vol. 1 contains a translation of p. 37-49, 77-218, and 322-347 of Teil 1 and p. 11-218 of Teil 2, of Anfänge der dialektischen Theologie, München, 1962-63, comp. by J. Moltmann.
Vol. 1, pt. 1 translated by Keith R. Crim; pt. 2 translated by Louis De Grazia and Keith R. Crim.
Includes bibliographical references.
1. Dialectical theology — Collections. 2. Theology — Collections — 20th cent. I. Moltmann, Jürgen, ed., Anfänge der dialektischen Theologie. II. Title.
BT83.R63 230 67-12044
Library of Congress [3]

RT
PP
DS
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SS
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TI

HOL: Holdings Data

	Call Number	Location	Copy Number	Status
Hol:				
Hol:				
Hol:				
Hol:				
Hol:				

HN:

FD - END

Additional information:

1. Every separate attribute must have beginning and ending brackets (< >)

2. Author-title added entries: a second comma must separate author from title.

BALLOTS Input Coding Sheet

	Initials	Date	Time Start	Time End
Acq. coding:	[illegible]	[illegible]	[illegible]	[illegible]
Coder:	[illegible]	3-19-68	[illegible]	[illegible]
Editor:	[illegible]	[illegible]	[illegible]	[illegible]
Term. Op.:				
Proof:				

.212

B CLARIFICATION OF THE USE OF D AND DS

The value of the attribute D is indexed as an access point for the In Process File. The value of DS is never indexed.

D is used to code an imprint date which contains a date capable of being indexed by the file building program. For example, dates in forms such as <1968>, c1968, 1968-, 1968 <c1968>, 1968?, 1968 are indexable and are coded as D for either acquisition only or L.C. bibliographic data.

DS is used to code an imprint date which is not in an indexable form. In this case, the Data Preparation Coder will supply a date coded as D. However, the coder will also precede the supplied date with a pound (#) sign. All information following a pound sign is suppressed during printing so that, in this case, the date will not be printed on the purchase order and yet will remain in the computer file as an index point.

C PROCEDURE FOR EDITING AND CODING VENDOR NAMES AND ADDRESSES

Due to the cost and the time required to maintain an ever growing computer vendor file, a new procedure on coding vendor names and addresses will be followed effective immediately. Data preparation will no longer continually add vendors to the computer file. The new computer vendor file contains a select set of 68 most commonly used vendors. (A listing of these vendors is available on request.) Vendors on this list will be coded, as before, by I.D. number (VID). Vendor names and addresses not on the list of 68 vendors will now be coded with the mnemonic codes VN (Vendor Names) and VAD (Vendor Address).

The Data Preparation Coder will

1. Check the Computer Vendor File Listing for the vendor assigned on the coding sheet.

2. If the vendor is on the list, code the vendor identification number as the mnemonic VID.

3. If the vendor is not on the list, verify the correct vendor name and address from the Rolodex Vendor File in the Order Department or from Fred Lynden if the vendor is not on the Rolodex. (Note: This step in the coding process will be done in batch after all other coding has been completed.) Code vendor name and address as mnemonics VN and VAD, according to the following rules:

    a. There can be no more than six (6) lines in the address (including the name).

    b. Each line is limited to 31 characters in length.

    c. The end of one line and the beginning of the next line will be indicated by a semi-colon (;).

    d. If the address is foreign, the country will stand alone on the last line in all capital letters.

    e. U.S. addresses will have a zip code two spaces after the state.

    f. Avoid abbreviations unless absolutely necessary.

Note: Sample vendor name and address after editing -

Gall and Inglis
13 Henrietta St.
London, W.C. 2, England

Appearance of name on computer output:

Gall and Inglis
13 Henrietta Street
London, W.C. 2,
ENGLAND

Note that it is no longer necessary to assign new I.D. numbers or to create file cards for new vendors.

Example of a U.S. address -

GSA
P.O. Box 1719, Boulder, Colo.
80302

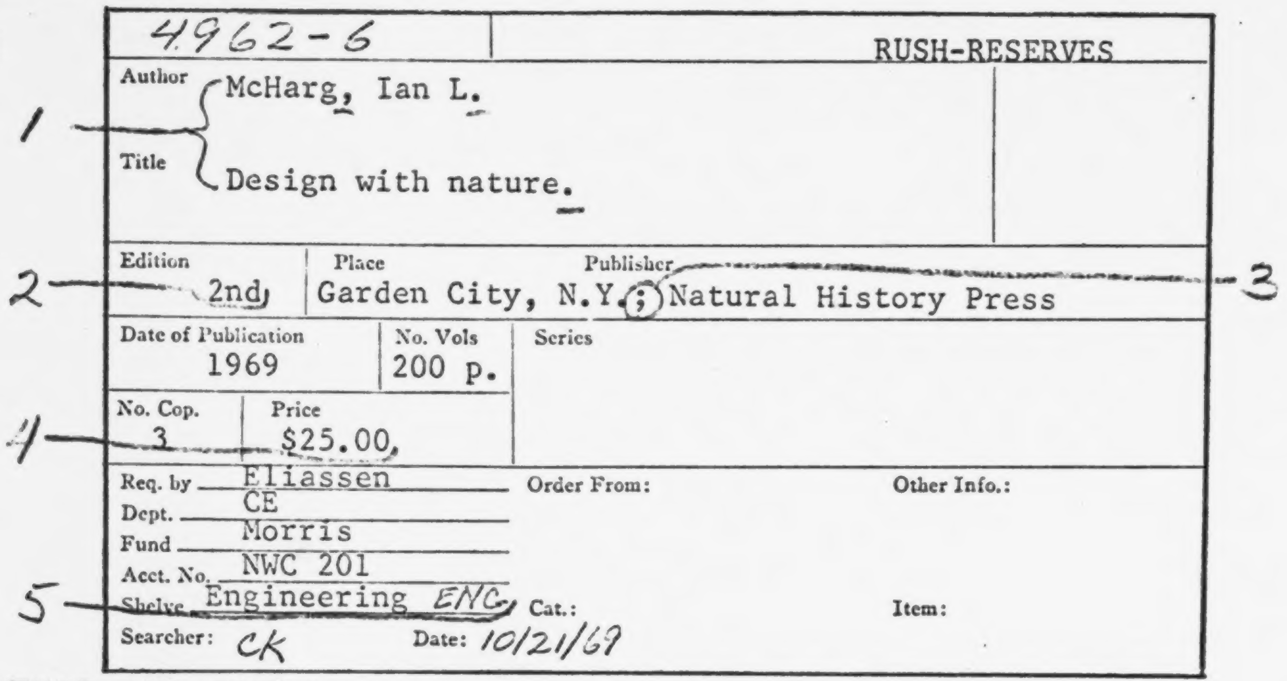
Appearance on computer output -

Geological Society of America
P.O. Box 1719,
Boulder, Colorado 80302

Note: The terminal operator will be trusted to insert two spaces between the state and the zip code.

D SIMPLE PRE-CODING FOR ORDER DEPARTMENT SEARCHERS

In order to facilitate the task of coding for Data Preparation it would be appreciated if Order Department searchers would provide the following small bits of information on the SUL-25 cards.



4962-6
RUSH-RESERVES
Author McHarg, Ian L.
Title Design with nature.
Edition 2nd
Place Garden City, N.Y. ;
Publisher Natural History Press
Date of Publication 1969
No. Vols 200 p.
Series
No. Cop. 3
Price $25.00
Req. by Eliassen
Dept. CE
Fund Morris
Acct. No. NWC 201
Shelve Engineering ENG
Searcher: CK
Date: 10/21/69
Order From:
Other Info.:
Cat.:
Item:

1. AUTHOR AND TITLE
   Check to see that each contains end punctuation; i.e., period, question mark, etc.

2. EDITION
   It is not necessary to repeat the English abbreviation "ed." It is sufficient to write just "2nd", "2nd rev.", "2, verb. Aufl.", etc.

3. PLACE; PUBLISHER
   Always separate the place from the publisher with a semicolon.

4. PRICE
   If there is no doubt that the price is U.S. dollars then please write the price with the dollar sign, the decimal point, and the two zeroes if necessary. For example, instead of $25 or 2500, write $25.00.

   If the price is in foreign currency, write in the foreign symbol; i.e., FL., DM, etc. When in doubt as to the nationality of the currency, just write whatever is known.

5. SHELVING LOCATION
   Write in the mnemonic code for shelving location in capital letters after the spelled out shelving location. (See directory of Mnemonic Codes for Shelving Locations.) For example, Falconer Biology FAL or Physical Education for Women Library PEDW. Since the request cards are xeroxed onto the coding sheets, it is important that the searchers write or print clearly and press firmly with the pencil.

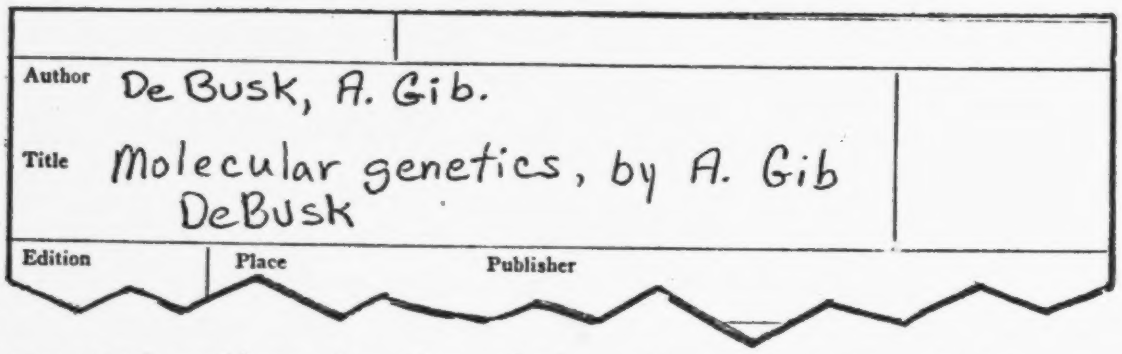
DIRECTORY OF MNEMONIC CODES FOR SHELVING LOCATION

LOCATION	MNEM.
Archive of Recorded Sound	ARS
Area P	LOCP
Art Library	ART
Asian Languages Library	ASL
Auxillary Collection - B	AUXB
Biophysics	BPHY
Branner Geology Library	BRAN
Briggs Memorial Library	BRIG
British Documents	BDOC
Catalog Division	CTDV
Chemical Engineering	CENG
Classics	CLAS
Communication - Journalism Library	COM
Computer Science Library	COMP
Cubberley	CUB
Dudley Herbarium	DUDH
Electrical Engineering Library	EENG
Engineering Library	ENG
Engineering Economic Planning	EEP
Falconer Biology Library	FAL
Felton Library	FELT
Filmstrip	FLMST
Food Reasearch Institute Library	FRI
Government Document Division	GOV
Graduate Program in Humanities	GHUM
Guggenheim Aeronautics	GUG
Gunst Memorial Library	GNST
Hansen Laboratories	HANS
Hopkins Marine Station	HMS
Institute of American History	IAH
Jones Room	JNS
Locked Stack	LOC
Mathematic - Statistics Library	MATH
Microtext Room	MTXT
Modern European Language Collection	MEL
Music Library	MUSC
Newspaper Room or Current Periodicals	CPER
Newton Collection	NEWT
Nuclear Technology	NTECH
Phys. Ed. for Women Library	PEDW
Physics Library	PHY
Plasma Physics Library	PPHY
Radioscience	RADIO
Rare Book Collection	RBC
Rare Book Collection Reference	RBCR
Reference Room	RR
Solid State Library	SOLID
Stack	STK
Stephen Timoshenko Library	TIMO
Swain Chemistry Library	SWAIN
Systematic Biology	SYST
Tanner Philosophy	TAN
West Library of Political Science	WEST

February 19, 1969
(Revised October 20, 1969)

E CODING OF AUTHOR(S) IN ACQUISITION INFORMATION WITHOUT AN LC CARD

If the acquisition information on the coding sheet contains an author and title such as -

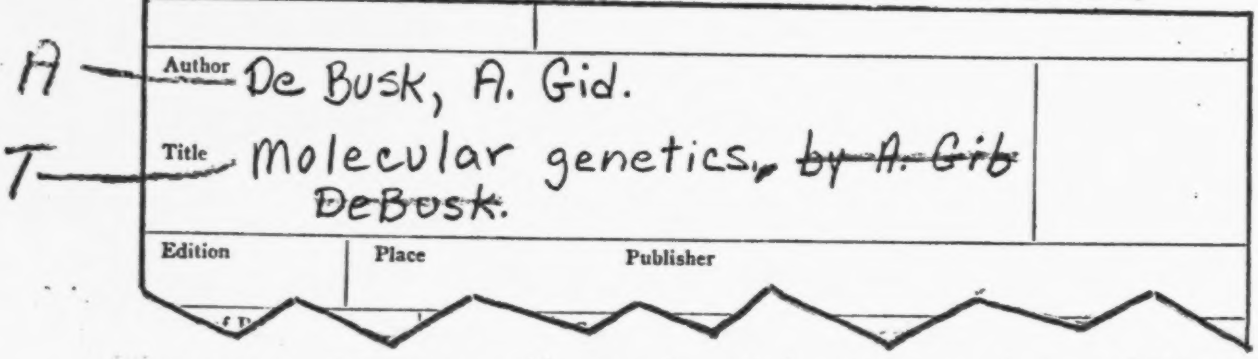


Author De Busk, A. Gib.

Title Molecular genetics, by A. Gib DeBusk

Edition Place Publisher

The repeated author in the title will not be coded.

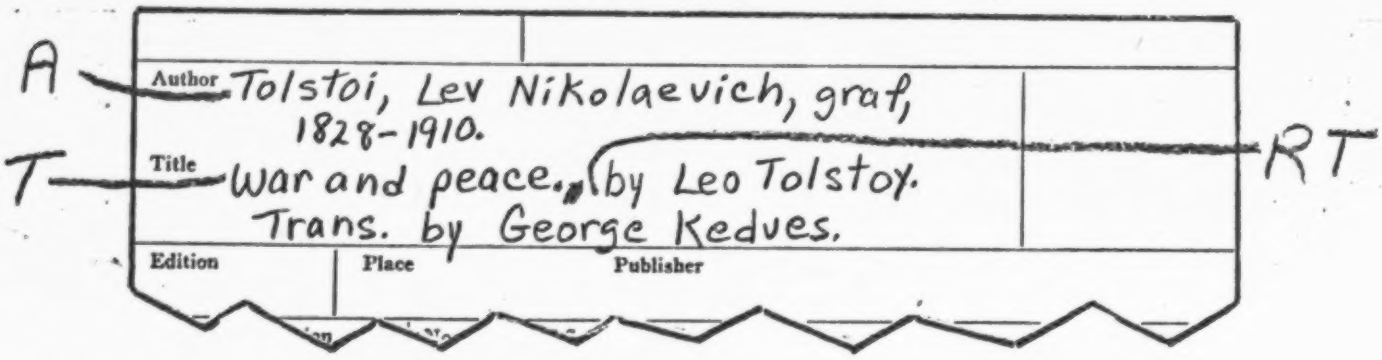


A — Author De Busk, A. Gid.

T — Title Molecular genetics, ~~by A. Gib DeBusk~~.

Edition Place Publisher

However, if the repeated author after title is not immediately recognizable as the main entry author or if there are multiple authors (editors, compilers, translators, etc.) which are not included in the main entry, the author or authors will be coded as RT (Remainder Title Statement).

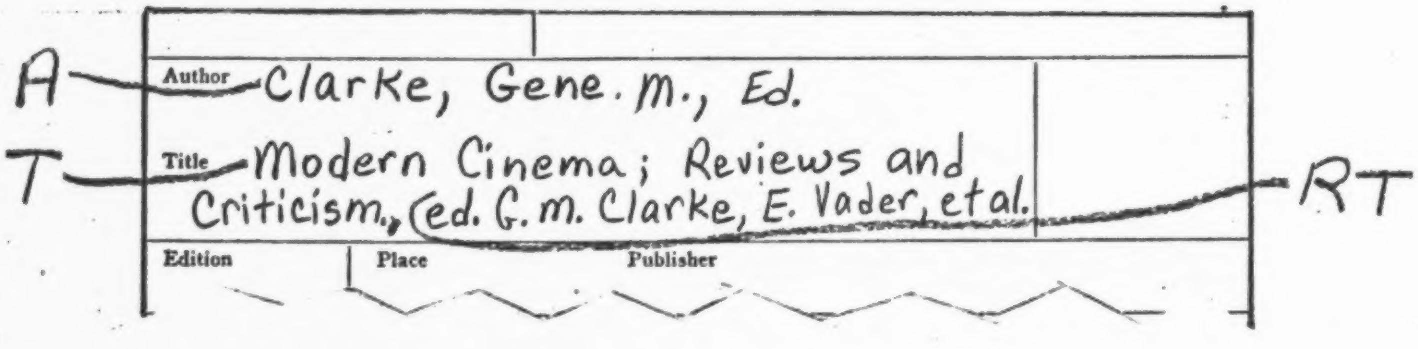


A — Author Tolstoi, Lev Nikolaevich, graf, 1828-1910.

T — Title War and peace., by Leo Tolstoy. Trans. by George Kedves. — RT

Edition Place Publisher

Or



A — Author Clarke, Gene. M., Ed.

T — Title Modern Cinema; Reviews and Criticism., ed. G. M. Clarke, E. Vader, et al. — RT

Edition Place Publisher

F DATA PREPARATION EDITING SYMBOLS

As an aid for all those working with coding sheets, the following editing marks will be used by Data Preparation and will be observed by Data Control during input.

OPERATIONAL SIGNS

MARK	ACTION	EXAMPLE	RESULT
ꝺ	Delete	Born Freeꝺ	Born Free
⁀ ‿	Close up; delete space	Every⁀‿body	Everybody
v	Insert space	King$\overset{s}{\vee}$George	King George
(sp.)	Spell out	Texas (U.)	Texas University
stet.	Let it stand	stet. ~~Trans.~~ By	Trans. By
¶	Paragraph	¶ Now is the time for all good men	Now is the time for all good men.
no ¶	Run paragraphs together	To come to the aid of their party. no ¶ Last year, the election was etc.	To come to the aid of their party. Last year, the election was etc.

TYPOGRAPHICAL SIGNS

MARK	ACTION	EXAMPLE	RESULT
/	Lower case	$\cancel{L}$owercase	lowercase
=	Capitalize	$\underline{\underline{c}}$apitalize	Capitalize
^	Insert	Ballots$\overset{\odot}{\wedge}$Wylbur	Ballots.Wylbur
∽	Transpose	Hapipness	Happiness
↪	Set in same line (or in same mnemonic code)	The story of my (N.Y.; MacMillian) ↪life as told etc.	The story of my life as told etc. (N.Y.; MacMillan)

G NON-ROMAN SCRIPT WITHIN BIBLIOGRAPHIC INFORMATION

If the bibliographic information on a coding sheet contains non-Roman script for which no Romanized equivalent is given, the bibliographic information cannot be included in our system at this time. Should a coder receive such a coding sheet, she WILL code the acquisition information but the L.C. Bibliographic Information will be crossed out. A note will then be written on the request in the Order File - "Do not purple flag."

Notes to Cataloging Regarding Coding

By the same token, if for any reason it is necessary to send a message regarding coding of L.C. Bibliographic Information to the Catalog Department a message will be written on the request slip in the Order File. An example of such a note might be - "Tracing III. US. coded as CA." should cataloging decide that the tracing was coded incorrectly, they will then know that an Update Sheet is needed.

DIAGNOSTICS (from the input program)

.... NORMAL END OF RUN
-termination with no noticeable program errors

.... ABNORMAL END OF RUN
-termination due to a program error; please contact a member of the SPIRES system group.

??? SYNTAX ERROR
-a syntax error has occurred in input data:
① an attribute name followed by something other than a quote
② a reserved word (or attribute string value) followed by something other than a legal reserved word (or legal string value)

--- END OF INPUT UNDER CONDITION
-physical end of input data was something other than END or the DELETE statement.
(NB diagnostics concerning DELETE syntax errors and attempts to recover from them have not been included.)

??? ATTRIBUTE IN ERROR attribute name
VALUE = attribute value
-these two lines precede any message involving incorrect attribute values; these messages are:

??? MULTIPLE VALUES NOT CONTIGUOUS
-within a given entry, multiple values for any given attribute must not be interspersed by any other different attribute.

??? NO SET NUMBEER ALLOWED FOR ATTRIBUTE VALUE
-illegal attribute (i.e. does not belong to given association group) given a set number

??? SET NUMBER REQUIRED FOR ATTRIBUTE VALUE
-incomplete use of set numbers within a given entry for a given association group of attributes

??? VALUE MUST BE INTEGER

??? ATTRIBUTE ASSOCIATED WITH VALUE IS SINGULAR
-multiple values are not allowed for this attribute

??? ATTRIBUTE VALUE IS AN EMPTY STRING

??? AUTHOR NAME HAS WRONG FORMAT

??? LENGTH OF VALUE TOO LONG

DIAGNOSTICS (page two)

??? JVP FORMAT WRONG
-journal, volume, page format in citation is incorrect

???USE ONLY DT "1" FOR CITATIONS

The following dianostics do not refer to only one specific attribute name and value:

??? PRESENT PROGRAM LIMIT OF 200 CITATIONS PER PREPRINT

??? INPUT STRING TOO LONG FOR BUFFER
-may be caused by a missing quote on an attribute value; if problem persists, contact SPIRES system group.

??? NO CF SETS FOR EACH ATTRIBUTE IN AN ASSOCIATION GROUP MUST BE EQUAL

??? ATTRIBUTE DESCRIPTOR TABLE PROBLEMS
-contact SPIRES system group

??? ENTRY TOO LARGE FOR DATA BASE BLOCK
-contact SPIRES system group

??? WARNING TRANSLATED TITLE USED WITHOUT LANGUAGE ATTRIBUTE

??? WARNING attribute name ATTRIBUTE NOT FOUND
-these warnings are to indicate to the user any indication of possible input error not considered serious enough to keep the entry involved from being placed in the data base!

(from INDEX)

value DOC TYPE CAUSED A CONVERSION ERROR

value SOURCE CAUSED A CONVERSION ERROR
-Document type (for PPT file) and source are expected to be numeric

(from STAT)

STATISTICS CANNOT HANDLE THIS INDEX FOR THIS USER

DO NOT HAVE A STATISTICS FILE FOR THIS DATA BASE

NO STATISTICS TAKEN PAST ATTRIBUTE # value

DO NOT HAVE A STATISTICS FILE FOR THIS INDEX
-For these and any other diagnostics not listed, contact the SPIRES system group

Use of SAJGE

SAJGE (pronounced: sajjy), is the SPIRES automatic Job Control Language generating system. It is currently used by the Data Control Supervisor to prepare data base update and tape dump programs on a regular schedule.

In the midst of an experimental and rapidly developing system with many different users, a facility like SAJGE allows JCL changes to be made more easily by the systems programers. It also provides the user file managers (such as the Data Control Supervisor) with a simplified way of setting up program runs.

SAJGE draws heavily on ORVYL, the Stanford Computation Center Campus Facility's time sharing monitor. The system prompts the user with a series of consecutive options. In this way the user is lead to specify the SPIRES program and files to be used, and the appropriate run time parameters.

The user is informed before each prompt which options are available. Responses are made to the ALTERS? prompt as normally used in WYLBUR, the text editing facility.

A printout showing the use of SAJGE to copy the In Process File from disk to tape is attached.

* * *

```
     You have entered SAJGE, a JCL generating system.
     Spires Programs currently (as of 9-4-69) supported under SAJGE are:

            CPYFILE --- used to copy SPIRES DISK FILES to TAPE FILES or
                        vice versa

            LSTFILE --- used to list SPIRES DATA BASE and INDEX files

     Using WYLBUR MODIFY CHARACTERS (r,d,i), change "progrm$" to the
desired supported program:

  1.    USE &F820.JESS.LOAD.START.progrm$ ON FILEH CLEAR
ALTERS ?                          rcpyfile
  1.    USE &F820.JESS.LOAD.START.CPYFILE ON FILEH CLEAR
ALTERS ?

   You have chosen the SAJGE option which copies Spires Files.
   Change "typ$" to one of these parameters:

          DSTP --- for copying (dumping) from disk to tape
          TPDS --- for copying (restoring) from tape to disk

   Change "ur$" to your User Mnemonic (IPF,PPT,ERC,GFO,HST,or TST).
   Change "scc#" to the Stanford Computation Center No. for your tape.
   Change "n#" to the 2-digit Spires No. for your tape.
```

```
    1.    USE &F820.JESS.LOAD.START.CPYFILE.typ$ ON FILEH CLEAR
  ALTERS ?                                  rdstp
    1.    USE &F820.JESS.LOAD.START.CPYFILE.DSTP ON FILEH CLEAR
  ALTERS ?
    2.    COPY ALL TO END FROM &F820.JESS.LOAD.USER.ur$ ON FILEH
  ALTERS ?                                          ripf
    2.    COPY ALL TO END FROM &F820.JESS.LOAD.USER.IPF ON FILEH
  ALTERS ?
QUEUED
   11.    - LAST LINE.
   17.    - LAST LINE.
    2.     CH 'SCC@' TO 'scc#' IN 1 NOLIST
 ALTERS ?                r2641
    2.     CH 'SCC@' TO '2641' IN 1 NOLIST
 ALTERS ?
    3.     CH 'TAPE@@' TO 'TAPEn#' IN ALL NOLIST
 ALTERS ?                      r07
    3.     CH 'TAPE@@' TO 'TAPE07' IN ALL NOLIST
 ALTERS ?
QUEUED
```

Now modify your JOB card, filling in acct. no., bin no., minutes, thousands of lines, hold status (T,D, or B), and name.

```
    1.    //DMP2641 JOB (act%,bn#,m#,l#,,,,$),'your$ name$',MSGLEVEL=1
 ALTERS ?                   rf829,439,15,,,T
    1.    //DMP2641 JOB (actf829,439,15,,,,T),'your$ name$',MSGLEVEL=1
 ALTERS ?                rf829,439,15,15,,,T
    1.    //DMP2641 JOB (F829,439,15,15,,,T),'your$ name$',MSGLEVEL=1
 ALTERS ?                                      d         dirobbie
    1.    //DMP2641 JOB (F829,439,15,15,,,T),'ROBBIE',MSGLEVEL=1
 ALTERS ?
```

Now submit this job. Save this JCL until the job has been run successfully under YOURNAME.JCL.JOBNAME. Do not modify this JCL for future runs. Send the operator appropriate mount instructions including scc tape no., Spires label, 9-track, read or write, acct no., and the job no.

THIS IS THE PROCEDURE FOR ADDING TO THE VENDOR ADDRESS FILE

After following the SIGN-ON procedure, please SET LENGTH = 36; SET TABS = 5; and SET UPLOW. Then USE GLEE.VEND.JCL on FILEH. DELETE line 10/LAST and COLLECT in the new data in the following format:

```
I A1072
    International Metallographic
    Society
    ATTN:  Publications Committee
    P.O. Box 219
    Los Alamos, New Mexico  87544
end
/*
```

The I for Insertion must be in column one. (1).
There must be at least one (1) blank between the insertion coding and the actual vendor number.
There must be at least one (1) blank before starting to type the vendor name and address. For sake of consistency, please use the SET TABS feature to begin the name and address lines in column five (5).
All foreign country names should come alone on the last lines of the address.
There may not be more the six (6) lines per entry for the name and address.
There may not be more than thirty-one (31) characters per line in the name and address. Please use the SET LENGTH feature for length warning. The 31 characters do not include the blanks preceeding the name and address.
Do not abbreviate, except where absolutely necessary.
There should be two (2) blanks between the state name and the Zip Code in United States addresses.
The END statement must begin in column one (1).
The last card should be a '/*' card.

For Backup purposes please copy the new vendor names and addresses into the end of the file names VENDORFILE.MASTER.<date> on FILEH. In order to locate the last date, simply use the SHOW DSNAMES LIKE VEND ON FILEH command. This will give you the last complete name of the masterfile. Then after copying in the additions to the file, please SAVE VENDORFILE.MASTER.<currentdate> ON FILEH and SCRATCH the old master file.

In order to process the additions to the file first save the JCL and your additions in the form VEND.<currentdate> ON FILEH. Then use the Command RUN UNNUMBERED. This will enter the job into the O/S batch to be processed.

ACQUISITION/CATALOG UPDATE REPORT

ID# ____

Change	Mnem		Mnem	To

Add or Delete Mnem		Value

HOL: Holdings Data

	Location	Copy Number	Volumes	Call Number	Variation	Status/Date
Hol:	;	;	;	;	;	
Hol:	;	;	;	;	;	
Hol:	;	;	;	;	;	

	Name	Date
Coder:		
Term Op.:		

BALLOTS Update-4
9/3/69

ACQUISITION/CATALOG UPDATE REPORT

ID0 ______________________

Mnem To

Value

HOL: Holdings Data

on	Copy Number	Volumes	Call Number	Variation	Status/Date
:	:	:	:	:	
:	:	:	:	:	
:	:	:	:	:	

	Name	Date
Coder:		
Term Op.:		

CLAIMING INFORMATION SHEET

I.D. No.____________________

CLD: (add) DATE________________;

OBJECT OF CLAIM (M or I)________________;

Bibliographic Descriptor and Copies______

____;

Manual Indicator -- M

OTHER: ADD/CHANGE/DELETE ____________________________

____

____

____

____

____

____

____

____

CODER NAME:________________________

BALLOTS--update--CLI--1

4-1-69

CANCELLATION INFORMATION SHEET

I.D. No. ____________________

CAN: (add) DATE ______________________________;

TYPE ______________________________;

BIBLIOGRAPHIC DESCRIPTOR & COPIES ____________

____

CANCELLATION REQUESTOR NAME ______________;

REASON FOR CANCELLATION ________________;

VENDOR ______________________________

PRO: (change) REISSUE P.O. NOW? Yes No (circle one)

VID: (change) CHANGE VENDOR TO ____________

MSV: (add) MESSAGE FROM VENDOR ____________

____

OTHER: (add/change/delete)

____

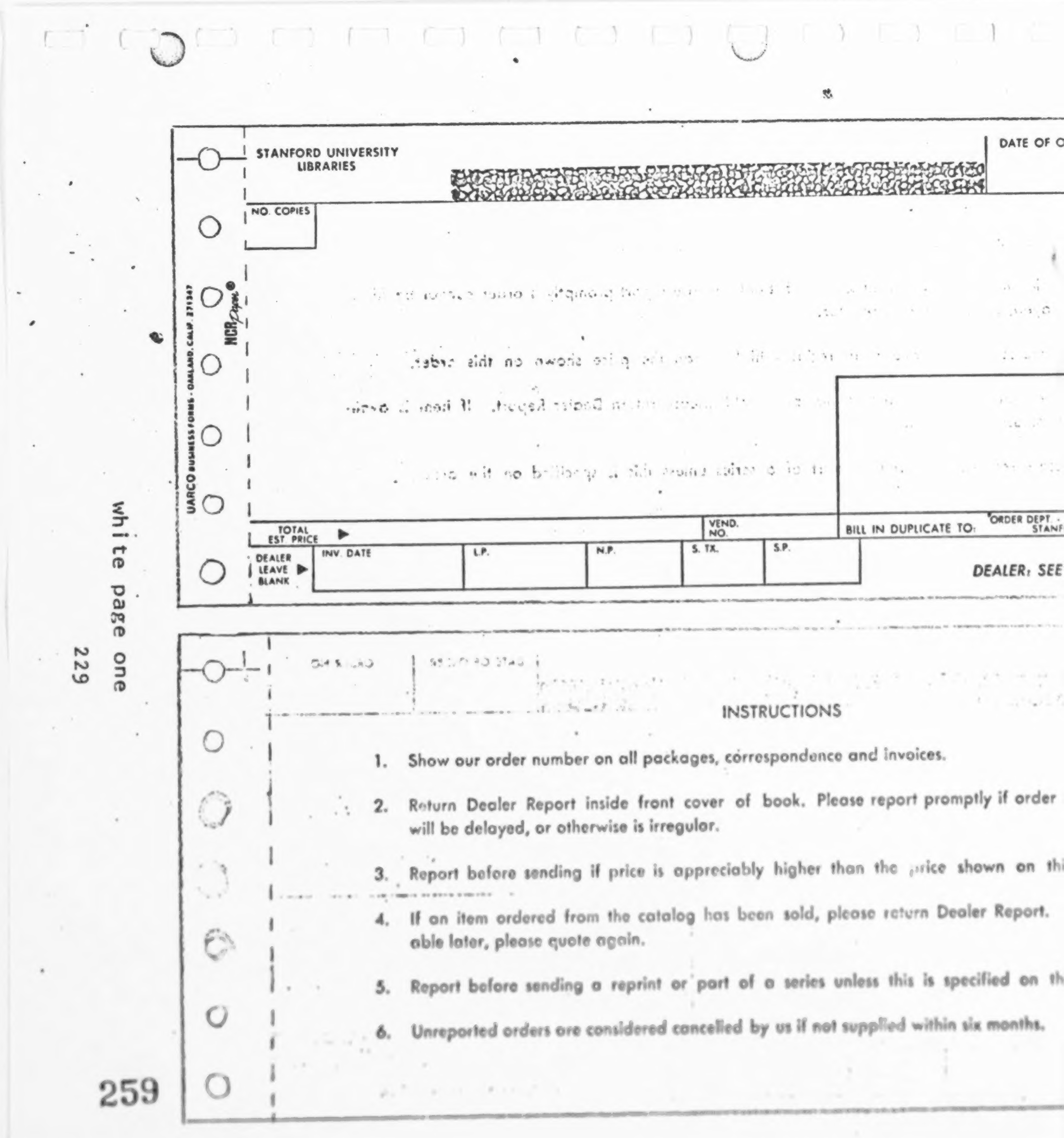
____

____

CODER NAME: ______________________________

BALLOTS--update--CIS--1

4-1-69



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DEALER: SEE

INSTRUCTIONS

1. Show our order number on all packages, correspondence and invoices.
2. Return Dealer Report inside front cover of book. Please report promptly if order will be delayed, or otherwise is irregular.
3. Report before sending if price is appreciably higher than the price shown on thi
4. If an item ordered from the catalog has been sold, please return Dealer Report. able later, please quote again.
5. Report before sending a reprint or part of a series unless this is specified on th
6. Unreported orders are considered cancelled by us if not supplied within six months.

white page one

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	DATE OF ORDER	ORDER NO.

$\frac{1}{54}$

VEND. NO.		BILL IN DUPLICATE TO:	ORDER DEPT. - STANFORD UNIVERSITY LIBRARIES STANFORD, CALIFORNIA 94305

L.P.	N.P.	S. TX.	S.P.	SUL-200 (1-69)

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INSTRUCTIONS

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n Dealer Report inside front cover of book. Please report promptly if order cannot be filled, e delayed, or otherwise is irregular.

t before sending if price is appreciably higher than the price shown on this order.

item ordered from the catalog has been sold, please return Dealer Report. If item is available later, please quote again.

t before sending a reprint or part of a series unless this is specified on the order.

ported orders are considered cancelled by us if not supplied within six months.

yellow page two
230

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NCR Paper®

TOTAL EST. PRICE ▶

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STANFORD, C

DEALER LEAVE BLANK ▶	INV. DATE	L.P.	N.P.	S. TX.	S.P.	DATE RECD.

DEALERSEE OTH

TO THE DEALER: Please return this slip inside front cover of item ordered. If you cenot su
indicate reason(s) below and return this slip at once.

- ☐ Not yet published.
- ☐ Out of stock.
- ☐ Out of print.
- ☐ To be reprinted.
- ☐ Sold.
- ☐ Searching.
- ☐ Order cancelled.
- ☐ Order on file.
- ☐ Probably available by__________
- ☐ Complete, discontinued, mend, susp
- ☐ Cost is__________
- ☐ Will quote.

Forms part of a series__________
Authors correct name is__________
Correct title is__________
Reprint of__________
☐ Not available separately. Do you want entire set?
☐ Other__________

	DATE OF ORDER	ORDER NO.

VEND. NO.

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:e return this slip inside front cover of item ordered. If you cannot supply, please
›w and return this slip at once.

:t published.
f stock.
f print.
reprinted.

hing.

☐ Order cancelled.
☐ Order on file.
☐ Probably available by____________________.
☐ Complete, discontinued, merged, suspended.
☐ Cost is__________________________.
☐ Will quote.

rt of a series____________________________________
orrect name is___________________________________
le is____
f ____
vailable separately. Do you want entire set?

PROMPT	RESPONSE	EXPLANATION	
SEARCH?	ipf	Library (In Process File)	FILES AVAILABLE TO SEARCH
	preprint	High Energy Physics	
	afhist	(African History)	
	geology	Geology Periodicals	
	eric	(Information Center)	
FIND?	a	(Author)	INDEXED DATA ELEMENTS
	ca	(Corporate Author)	
	cf	(Conference Author)	
	ti	(Title)	
	d	(Date) (Subset of other index entries)	
	id	(ID Number)	
	tp	(Topic) (Not used for ipf and preprint)	
	and		LOGICAL CONNECTORS
	not		
	or		
	(DATA ELEMENTS - see above)		
	(LOGICAL CONNECTORS - see above)		
	backup	(returns search to previous step)	
	restart	(clears present search)	
	type	(lists short form of output)	
	type extended	(lists entire copy)	
OPTION?	restart	(clears present search)	
	search	(continues present search)	
	type		
	type extended		
	exit	(exits user from SPIRES)	
	show news	(lists out news about system)	
BACKUP?	yes		
	no		
	to spires	(Legal after all prompts except BACKUP? allows user to send comments on the use of the system to the SPIRES group.)	

";" serves as an implicit "and" between lines.
Search statements may be constructed on any word or words in the title, and on any form of the author which includes surnames.
Search statements may be continued beyond one line by use of the symbol @.
Words and names may be truncated after the third letter by use of the pound sign: e.g. Smi#.
Date searches must always follow another element search.
Date searches are formatted:d 1969; d before 1969; d after 1968; d from 1965 thru 1968.
Two digit year representations and standard abbreviations for months are accepted.

Sample Searching Arguments using BALLOTS/

```
 1.  COMMAND? spires
 2.  *Welcome to SPIRES
 3.  SEARCH?  ipf
 4.  FIND? ti intimate
 5.  TITLE WORD SEARCH FOR... INTIMATE
 6.          3  DOCUMENT(S) ACCUMULATED
 7.  ? ti enemy
 8.  TITLE WORD SEARCH FOR... ENEMY
 9.          1 DOCUMENT(S) ACCUMULATED
10.  ? type extended

11.  ID:                      2977-2
12.  AUTHOR:                  Bach, George
13.  TITLE:                   The intimate
14.  PLACE/PUBLISHER:         New York;  Mo
15.  DATE:                    1969

16.  OPTION? restart
17.  FIND? a george bach and a peter wyde
18.  ? after June 1968
19.  AUTHOR SEARCH FOR... GEORGE BACH
20.  AUTHOR SEARCH FOR... PETER WYDEN
21.  TITLE WORD SEARCH FOR... INTIMATE
22.  TITLE WORD SEARCH FOR... MARRIAGE
23.  DATE SEARCH FOR... AFTER JULY 1, 196
24.          1  DOCUMENT(S) ACCUMULATED
25.  type extended

26.  ID:                      2977-2
27.  AUTHOR:                  Bach, Georg
28.  TITLE:                   The intimat
29.  PLACE/PUBLISHER:         New York;
30.  DATE:                    1969

31.  OPTION? restart
32.  FIND? a may
33.  AUTHOR SEARCH FOR... MAY
34.          2  DOCUMENT(S) ACCUMULATED
35.  ? d before 1920
36.  DATE SEARCH THRU 1919
37.          0  DOCUMENT(S) ACCUMULATED
38.  BACKUP? yes
39.  SEARCH RESULTS RESET TO LAST
40.  ? d from 1919 thru 1967
41.  DATE SEARCH FROM JAN-1-1919 THRU 19
42.          1  DOCUMENT(S) ACCUMULATED
43.  ? type extended

44.  ID:                      4039-6
45.  AUTHOR:                  May, Leopol
46.  TITLE:                   Spectroscop
47.  PLACE/PUBLISHER:         New York;

48.  OPTION? exit
```

File)
FILES
AVAILABLE
TO SEARCH

)

INDEXED
DATA
ELEMENTS

other index entries)

(for ipf and preprint)

LOGICAL
CONNECTORS

us step)

put)

h)

stem)

except BACKUP?
ments on the use
PIRES group.)

n lines.
n any word or words
uthor which includes

ound one line by use

the third letter by

hor element search.
before 1969; d after

andard abbreviations

Sample Searching Arguments using BALLOTS/SPIRES System

```
1.  COMMAND? spires
2.  *Welcome to SPIRES
3.  SEARCH?  ipf
4.  FIND? ti intimate
5.  TITLE WORD SEARCH FOR... INTIMATE
6.            3  DOCUMENT(S) ACCUMULATED
7.  ? ti enemy
8.  TITLE WORD SEARCH FOR... ENEMY
9.            1 DOCUMENT(S) ACCUMULATED
10. ? type extended

11. ID:                        2977-2
12. AUTHOR:                    Bach, George Robert, 1914-    Wyden, Peter, Joint author.
13. TITLE:                     The intimate enemy;  how to fight fair in love and marriage
14. PLACE/PUBLISHER:           New York;  Morrow
15. DATE:                      1969

16. OPTION? restart
17. FIND? a george bach and a peter wyden and ti intimate and ti marriage and d@
18. ? after June 1968
19. AUTHOR SEARCH FOR... GEORGE BACH
20. AUTHOR SEARCH FOR... PETER WYDEN
21. TITLE WORD SEARCH FOR... INTIMATE
22. TITLE WORD SEARCH FOR... MARRIAGE
23. DATE SEARCH FOR... AFTER JULY 1, 1968
24.           1  DOCUMENT(S) ACCUMULATED
25. type extended

26. ID:                        2977-2
27. AUTHOR:                    Bach, George Robert, 1914-   Wyden, Peter, joint author.
28. TITLE:                     The intimate enemy;  how to fight fair in love and marriage
29. PLACE/PUBLISHER:           New York;  Morrow
30. DATE:                      1969

31. OPTION? restart
32. FIND? a may
33. AUTHOR SEARCH FOR... MAY
34.           2  DOCUMENT(S) ACCUMULATED
35. ? d before 1920
36. DATE SEARCH THRU 1919
37.           0  DOCUMENT(S) ACCUMULATED
38. BACKUP? yes
39. SEARCH RESULTS RESET TO LAST         2 DOCUMENTS
40. ? d from 1919 thru 1967
41. DATE SEARCH FROM JAN-1-1919 THRU 1967
42.           1  DOCUMENT(S) ACCUMULATED
43. ? type extended

44. ID:                        [illegible]
45. AUTHOR:                    May, Leopold, comp.
46. TITLE:                     Spectroscopic tricks.
47. PLACE/PUBLISHER:           New York;  Plenum Press

48. OPTION? exit
```

6.6 Sample Analysis/Design Standards

(referred to in subsection 2.5.1
and in sections 2.6 and 2.10)

1. Data Elements Handbook
2. Library System Notes Index
3. Library System Note No. 18
4. Computer System Notes Index
5. Computer System Note No. 38
6. Acquisition Study Contents plus Sample Pages

Project BALLOTS
Subject: File Organization & Content
Library System Note No. 4 (Revised)
Name: Eleanor Montague
Date: November 13, 1968 (Revised July 18, 1969)

GUIDE TO MARC FILE AND IN PROCESS FILE ATTRIBUTES[1]

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
A	M	PN	Personal Author Name	99	<Name: Surname, Forename, Initial, etc.> <Numeration> <Suffix Title> <Prefix Title> <Dates> <Relator> <Form Subheading>[2] <Title of Work>
AA	M	PN	Variant form of Personal Author Name	99	See A
ADD	S		Ship to Address	60	See Appendix II
AE	M	PN	Established Personal Author Name	99	See A
*ANO	M	PN	Name not Capable of Authorship	300	Change: New attribute
BAC	S		Budget Acct Code	7	<6 Character Code>
BIB	M		Bibliography Note	120	

---

[1] Items modified for this list are marked with an * and the change noted.

[2] See Appendix III for discussion.

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
BUD 1	M		Budget Amount	50	<Billed Amount>; <Bibliographic descriptors or S if same as ORD>; ST State Tax ; CT County Tax ; SC Shipping Charges Note: 1. If amount in foreign currency, code and input foreign currency; no manual conversion will be made.
CA	M	CN	Corporate Author Name	300	See CAE
CAA	M	CN	Variant form of Corporate Author Name	300	See CAE
CAE	M	CN	Established Corporate Author Name	300	<Name> <Subordinate Unit> <Relator> <Form Subheading> <Title of Book[3]>
CAI	M		Cataloging Approval Director	14	1 Approval of original cataloging information; <cataloger's initials ; date> 2 Approval of changes made to pre-cataloging information; <cataloger's initials ; date>
CAN	M		Cancellation Information	70	<Date>; <Type of Cancellation>; R Requestor D Dealer L Library {Bibliographic Descriptors Number of Copies[4] OR S if same elements as ORD} ;

---

[3] See Appendix III for discussion.

[4] For discussion, see "Representation of Volume, Part, Fascicle, etc.", by Jerry West.

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
CAN - continued -					<Name of person requesting cancellation>; <Reason for cancellation>
CAT	M		Cataloging Authority, Changes in LC Information or Notes to Catalog Div.	240	
CF	M	CF	Conference Author Name	300	<Name> <Number> <Place> <Date> <Subordinate Heading> <Miscellaneous Information> <Form Subheading> <Title of Book[5]>
CFA	M	CF	Alternative Form of Conference Author Name	300	See CF
CFE	M	CF	Established Conference Author Name	300	See CF
CLA	M		Claiming Information	70	<Date of Claim>; <Type of Claim>; M Material I Invoice {Bibliographic Descriptor Information Number of Copies OR S if same as ORD}

---

[5] See Appendix III for discussion.

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MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
CLD	M		Claim Date	70	<Claim Date>; <Object of Claim>; M Material I Invoice <Bibliographic Descriptor or S if same as ORD>; M Manual Indicator
CLT	S		Claim Type	2	1. Rush Order (Domestic) 2. Rush Order (Foreign) 3. Current American Imprints 4. Non-current American Imprints 5. Current Overseas Imprints (Europe) 6. Non-current Overseas Imprints (Europe) 7. Current Overseas Imprints (Asia & Africa) 8. Non-current Overseas Imprints (Asia & Africa) 9. Latin American Imprints 10. Standing Orders 11. Invoices 12. Partial Shipments (American) No dealer report 13. Partial Shipments (Overseas) No dealer report 14. Invoice and Material Received discrepancy 15. Claim sent -- No Action
CNT	S		Form of Content	3	BIB Bibliography CAT Catalog IND Index (work itself is an index) ABS Abstract DIC Dictionary ENC Encyclopedia DIR Directory YBK Yearbook STA Statistical Compilation HBK Handbook PRT Programmed Textbook
CP	S		Country of Punlication[6]	3	<2-3 Character Code> Note: 1. The country will be assumed to be the United States by default.

---

[6] For place codes, see "MARC Place Codes" Prepared by Library of Congress, Information Systems Office, 1968.

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
CRD	S	M	Library of Congress Card Number	25	
D	S		Date	64	Note: 1. The date in D is the date indexed upon.
DC	S		Dewey Class Number	14	
DES	M		Desiderata Indicator	2	OP Out-of-Print, but wanted (Use with PRO X) NP Not yet Published OS Out of Stock X Out on Search in Manual System (Use with PRO X)
DS	S		Imprint Date	40	
ED	S		Edition Statement	60	
FD	S		Date Entered IPF	10	MM-DD-YY
FOP	S		Force Payment	64	<Bibliographic Descriptor or S if same as ORD> Note: 1. Deleted by update program when IVP updated.
FRM	S		Form of Reproduction	3	PHD Phonodisk MTS Mag. Tape (Sound) MFM Microfilm Roll MFC Microfiche MOP Micro-opaque

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
FRM	- continued -				MTA Mag. Tape (Date) OTH Other CLB Large Print
GN	M		General Notes	400	
GOV	S		Government Publication Indicator	2	U Federal (U.S.) S State I International L Local F Foreign
HN	M		Holdings Note	40	<Bibliographic Descriptor>; <Location> Note: 1. "Informal" note for the control of uncataloged copies of material for which the library does hold cataloged copies.
HOL	M		Holdings Information	60	<Call Number>; <Location>; <Copy Number>; <Status/Date> Note: 1. Copy numbers will be given in the form: C.X. (C.1 understood by default.)
ID*	S	ID	Identification Number	10	<1 - 7 digits> Note: 1. Required for IPF. Change: from MAX=8 to MAX=10
ILL	S		Illustration	90	

---

[7] Status Code: M - missing; L - lost; N - non-circulating.

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
IMP	M		Imprint Information	100	
IVP	M		Invoice Payment Indicator	50	<Date>; <Bibliographic Descriptor or S if same elements as ORD> Note: 1. Internally generated; not an input attribute.
IVR	M		Invoice Receipt Information	100	<Date of Invoice Receipt>; <Invoice Number>; <Dealer date of invoice>; Bibliographic Descriptor Information Number of Copies OR S if same as ORD
L	S		Language[8]	48	Language(s) ; Language(s) of summaries Note: 1. For subelement one alone, eng is assumed by default. 2. For example: engfre;rus
LC	S		Library of Congress Call Number	40	
LCA*	M		Alternative Library of Congress Call Number	40	Change: New attribute.
LNK	M		Link Statement	50	<Type of Record Linked to>: <ID# of that record>; Bibliographic descriptor or, if not available, author's last name and short title (or both identifications if necessary) (In Master Record)

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[8] For codes, see "MARC Language Codes", prepared by Library of Congress, Information Systems Office, 1968.

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
MAE*	S		Converted from MARC	8	Change: From MAX=1 to MAX=8
ME	S		Main Entry Indicator	5	<Attribute Mnemonic> <Element Number>
MET	S		Main Entry in RT Indicator	1	1 Present
MRI	M		Material Receipt Information	70	<Date of Receipt>; {Bibliographic Descriptor Information Number of Copies OR S if same as ORD}
MSV	M		Message From Vendor	240	<Date> <Message>
NBN*	M		National Bibliography Number	20	Change: New attribute
NC	M		Notes -- Contents	300	
NUC	S		Nat. Union Catalog Indicator	1	1 Send Notification
ORD	S		Order Information	140	{Bibliographic Descriptor Information Number of Copies}; <Information Comments> ;[9] <Language of Bibliographic Descriptor Information>[10]

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[9] An example would be: New Series

[10] For Language Codes, "MARC Language Codes," Prepared by Library of Congress, Information Systems Office, 1968.

MNEM	S/M	INDEX	NAME.	MAX LTH	CODES/FORMAT CONTENT
ORD -	continued -				Note: 1. The language is considered eng by default.
PAC	S		National Program for Acquisition and Cataloging Indicator	12	1 Send Notice <Date> ; <Message>
PG	S		Pagination	25	
PME	S		At Head of P.O. Entry	5	<Attribute Mnemonic> <Element Number> Note: 1. If entry to be printed at the head of the P.O. is not the main entry, PME will point to the information which is to be at the head of P.O.
PO	S		Purchase Order Message	10	1 (for Serials): Subscription to begin with ________________ and to continue until further notice. 2 (for series, term. sets, open entries): ______________ and all future volumes as published. 3 All volumes published and a standing order for future volumes 4 Do not duplicate on University Press standing order. 5 Do not duplicate on Blanket order. 6 Do not duplicate on standing order. 7 Please quote on back issues. 8 Please charge to Stanford University Library's deposit account, acct. no. __________________ 9 Prepaid Note: 1. More than one code may be included in P.O. Separate codes by a comma.

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
PP	M		Place/ Publisher	300	<Place, Place, etc.> ; <Publisher>
PR	S		Total Estimated Price	22	<Estimated Price (total price to be printed on Purchase Order)>
PRE	S		Pre-cataloging Indicator	10	1 Pre-cataloged 2 Copied from MARC; date
PRI	S		Post Receipt Priority	1	1 Urgent (highest priority) 2 Rush 3 Current Interest 4 Research Interest (lowest priority) 5 Deferred
PRO	S		Type of Procurement	2	po Regular Purchase Order pp Prepayment P.O. pd Deposit Account P.O. s Standing Order a Approval b Blanket g Gift e Exchange x Inactive file material (e.g. in print or out-or-print desiderata) y All other
PUX	S		Additional Acquisition Information	60	
RAD	S		Requestor Address or Department	60	<Street or Dept > ; <City, State>

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
REC	S		Type of Record	2	<1 - 2 Character Code>
RID	S		Requestor Identification Number	3	
RN	S		Requestor Name	60	
RNI	S		Requestor Notification Indicator	1	1 Send Notice upon receipt of material 2 Send Notice upon completion of processing
RT	S		Remainder of Title Statement	200	Note: 1. Used to code all data after subtitle and before edition statement.
SBN	M		Standard Book Number	16	
SD*	S		Subscription Date	10	Change: New attribute
SEA*	M		Series Entry Personal Author	200	Change: New attribute
SHE	M		Shelving Location	30	<Location>; {Bibliographic Descriptor Information Number of Copies} Note: 1. If bibliographic descriptor information equals that in ORD, leave blank in SHE.

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
SI		S	Searcher's Initials	3	<3 Character Code>
SIZ		S	Size	10	
SEI*	M		Series Added Entry	240	Note: 1. Use SEA to code series entry Personal Name Change: from S/M=S to S/M=M
SPO	S		Special Acquisition Series Information	240	
SS	M		Subject Heading	100	Note: 1. Use SUA to code Subject Personal Name.
SSA*	M		Series Personal Author	200	Change: New attribute
SSI	M		Series Statement	240	Note: 1. Use SSA to code Series Personal Name.
STA	M		Material Process Control	70	<Location, Date> ; LC Awaiting Library of Congress Information MA Awaiting Information from MARC CD Catalog Division EP End Processing Department CI Circulation Division O Other {Bibliographic Descriptor Information Number of Copies}

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
STA	- continued -				Note: 1. Leave bibliographic descriptor information sub-element blank if all elements equal elements of ORD.
SUA*	M		Subject Personal Author	200	Change: New attribute
T	S	TW	Title	300	<Short Title> <Sub-Title>
TA	M	TW	Added Title	240	<Short Title> <Sub-Title>
TI*	S		Tracing Indicator	40	<Attribute mnemonic> <Element number> Change: From MAX=100 to MAX=40
TR[11]	S		Translation	13	1<Language of the text> 2<Language from which the text was translated> 3<Original language if different from the language from which text was translated> 4<Language(s) of summaries> Note: 1. For example: leng2fre
TRO*	M		Title -- Romanized	300	Change: New attribute
TU*	M	TW	Uniform Style	120	Change: From S/M=S to S/M=M

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[11] For Language codes, see "MARC Language Codes", prepared by Library of Congress, Information Systems Office, 1968.

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
TYP	S		Type of Work	2	f Festschrift z Fiction b Biography d Dissertation, thesis
VAD	S		Vendor Address	60	
VCT	S		Vendor Catalog Information	40	<Catalog Name or Number>; <Item Number> Note: 1. For example: VCT=; 4/68-0219 or VCT 200
VID	S		Vendor Identification Number	5	<5 Digit Code>
VN	S		Vendor Name	60	
VSP*	M		Message to Vendor	75	Note: 1. For example: Rush, Please Bind, 5th ed. only, Autographed Copy only, etc. Change: From S/M=S to S/M=M
XOR	S		Type of Order	3	
XT	S		Incomplete Record	1	1 Diacritical marks not included 2 Incomplete record (specified by MARC)
XX	M		Notification Name and Address	240	<Name> ; <Street Address or Dept. Name>; <City, State Zip>

MNEM	S/M	INDEX	NAME	MAX LTH	CODES/FORMAT CONTENT
XX - continued -					Note: 1. To be used when requestor notification to be sent to person other than requestor. 2. An address with two sub-elements will be assumed to be Stanford University, Inter-departmental Mail.

APPENDIX I

Indexes

File	Index	Name	Contents
IPF/MARC	PN	Personal Name Index	Name indexed to second comma in PN. Attributes indexed in PN are: A, AE, AA.
IPF/MARC	CN	Corporate Name Index	Attributes indexed are: CA, CAE, CAV.
IPF/MARC	CF	Conference Name Index	Attributes indexed are: CF, CFE, CFA.
IPF/MARC	TW	Title Word Index	Attributes indexed are: TU, T, TA.
IPF	ID	Identification Number Index	Attributes Indexed: ID.
IPF/MARC	D	Date Portion of PN, CN, CF, TW Indexes.	Attribute indexed: D.
MARC	M	LC Card Number	Attribute indexed: CRD.

APPENDIX II

Attribute ADD: Ship to Addresses

Code	Address	Condition
1	Order Department Stanford University Libraries Stanford, Calif. 94305	Material and invoice to same location
2	Serial Department Stanford University Libraries Stanford, Calif. 94305	Material and invoice to same location.
3	Current Periodicals Desk Stanford University Libraries Stanford, Calif. 94305	Material to this location; invoice to Order Department.
4	Meyer Undergraduate Library Stanford University Libraries Stanford, Calif. 94305	Material to this location; invoice to Order Department.
5	Lane Medical Library Stanford Univ. Medical Center Stanford, Calif. 94305	Material and invoice to same location.
6	Humanities and Social Science Reference Stanford University Libraries Stanford, Calif. 94305	Material and invoice to same location.
7	Library Food Research Institute Stanford University Stanford, Calif. 94305	Material and invoice to same location.
8	Library Food Research Institute Stanford University Stanford, Calif. 94305	Material to this location; invoice to Order Department.

Attribute ADD: Ship to Addresses

Code	Address	Condition
9	Director Stanford in Germany Landgut Burg 7056 Beutelsbach bei Stuttgart GERMANY	Material to this location; invoice to Order Department.
10	Director Stanford in Italy Villa S. Paolo Via della Piazzola, 43 Firenze, ITALY	Material to this location; invoice to Order Department.
11	Director Stanford in Austria Seilerstatte 30 1010 Vienna AUSTRIA	Material to this location; invoice to Order Department.
12	Director Stanford in Britain Harlaxton Manor Grantham, Lincolnshire ENGLAND	Material to this location; invoice to Order Department.
13	Director Stanford in France 1, Place Anatole-France Tours, Indre et Loire FRANCE	Material to this location; invoice to Order Department.
14	Library Mr. Alan Baldridge Hopkins Marine Station Pacific Grove, Calif. 93950	Material to this location; invoice to Order Department.
15	Document Division Stanford University Libraries Stanford, Calif. 94305	Material and invoice to same location.
16	(Individual requestor's name and address)	Material to this location; invoice to Order Department.

APPENDIX III

Author-Title Entries

In the case of an author-title entry, the title will be coded and input as a sub-element of the author attribute.

With the present index construction, a title coded as part of a personal name will not be indexed whereas a title as part of a corporate or conference name will be included as index words in the corporate name index and conference name index, respectively. Therefore, at the present time, if the title portion of an author-title entry is significant and is not coded elsewhere as T or TA, it should be coded as TA and input. The title so coded as TA will be indexed in the title word index.

LIBRARY SYSTEM NOTES

Number	Title	Date
1	Project Assignments	10/14/68
2	Continuous Testing	10/22/68
2a	MARC Conversion	11/31/68
3	MARC Conversion	10/22/68
4	Attribute List	2/24/69
5	Survey	12/17/68
6	Exclusion List	1/17/68
7	Diacritics	2/7/69
8	P.O. Output Spec.	1/9/69
9	Short Form Output	1/9/69
10	Science Approval	2/20/69
11	Interface	2/19/69
12	IPF Building Alternatives	12/3/68
13	Schedule	1/24/69
14	Checklist of Requirements	1/24/69
15	File Organization	3/3/69
16	Flow Charting Techniques	3/5/69
16 rev.1	Flow Charting Techniques	10/22/69
17	Program Specifications for Acq. Purchase Order Printing	1/9/69
18	Claim and Cancellation Notice Program Specifications	3/11/69
19	Schedule of Activities for Acq. and Biblio. Coding Ed.	3/12/69
20	Bibliographic Coding Procedures	3/17/69
21	File Organization	3/17/69
22	Sample Search Argument	3/17/69
23	MARC Conversion	10/24/68
24	MARC Conversion	10/31/68
25	MARC Conversion	11/12/68
26	Data Control	3/26/69
27	Update to Spec. for Acq/ P.O. Printing	4/9/69
28	Data Control	2/27/69
29	Meyer/Main Library Circ. System Requirements	3/15/69
30	Circulation System	4/21/69
31	Report Prep. Schedules	4/29/69
32	Comparative Acq. Statistics	5/2/69
33	Report Generations and Statistics Gathering: A Problem Definition	5/5/69
34	Circulation System	4/5/69
35	MARC Conversion	5/14/69
35 Rev. 1	MARC Conversion	6/5/69
35a	Circulation System	5/7/69
36	On-Line Input	5/19/69
37	On-Line Input	5/23/69
38	System Diagnostics	5/23/69
39	Attribute List Update	6/2/69
40	SPIRES Reference Index	6/6/69
41	MARC Conversion	6/16/69
42	Data Base Building specs.	6/12/69

LIBRARY SYSTEM NOTES

Number	Title	Date
43	Plans & Schedules	6/12/69
43 rev. 1	Plans & Schedules	7/29/69
44	Plans & Schedules	6/13/69
45	Plans & Schedules	6/13/69
46	Short form update	6/17/69
47	Organization Chart	6/17/69
47a	Special Character Handling	7/7/69
48	Check Digit Algorithm	6/17/69
49	Special Charac. & Diacritical Marks	7/10/69
50 item 1,2,3,4.	Data Preparation conting.	7/25/68
51 items 1-7.	MARC Coversion Spec. Updates	9/2/69
52	Cat. Design Study	7/25/69
53	Voucher printing & claim generation	7/28/69
54		missing 11/17/69
55	Requestor file proposal	8/11/69
56	Requestor notice printing specs.	8/21/69
57	Use of MARC	8/69
58	On-Line input: a cost analysis	9/2/69
59	On-Line Searching	9/26/69
60	DC & DP Statistics	10/9/69
61	Program Spec. for NPAC Notice Printing	10/17/69
61a	Cost of including Subject Heading, LC Class Number & Series Statement Indexes to the local MARC Data Base	10/24/69
62	Types of System Documentation	10/22/69
63	Cost of MARC Indexes	10/24/69
64	Procedure Manual	10/22/69
65	Catalog Card Production Feasibility Study: Final Report	10/23/69
66	Operating cost under SPIRES	10/28/69
67	Exclusion lists for title and author indexes	11/21/69

Project BALLOTS
Subject: Acquisition System Design
Library System Note: No. 18
Name: Jerry West
Date: March 11, 1969
Title: Claim and Cancellation Notice Program
Specifications

Purchase Order Program Specification for Printing Cancellation Notices

A. General Rules
   1. The Cancellation Notices should be printed using the same specifications as for P.O. printing except as noted below in C.
   2. The Cancellation Notices should be grouped together following the P.O.'s, in sequence by Vendor number.

B. Attributes
   The following list of attributes will be printed on the Cancellation Notice:
   1. The Order Number (ID)
   2. Date of Order (FD)
   3. Price (PR)
   4. Vendor Number (VID)
   5. Main Entry (ME) or Head of P.O. indicator (PME)
   6. Title (T) (If ME or PME don't point to T, TA, or TU)
   7. Edition Statement (ED)
   8. Place/Publisher (PP)
   9. Bibliographic Descriptor from CAN or ORD. If the descriptor in CAN = S then use the descriptor from ORD; else use the descriptor in CAN.

C. Detail specifications and exceptions to general rule A-1 above. (Refer to P.O. specs and form layout.)
   1. Print cover sheet with vendor address as per P.O. specs.
   2. Name of form (area #1 in form layout). Print "CANCELLATION NOTICE" on line 1 and line 3. (centered)
   3. Date of Order (area #2). Print as per P.O. specs.
   4. Order Number (area #3). Print as per P.O. specs.
   5. Ship to and billing information (area #5) Omit.
   6. Total Est. Price (area #6). Print as per P.O. specs.
   7. Vendor Number (area #7). Print as per P.O. specs.
   8. Number of Copies (area #8). Print as per P.O. specs. This information will be in the bibliographic descriptor in either CAN or ORD. (see B-9 above)
   9. Bibliographic Information (area #4). Print only ME or PME, T, (if PME or ME don't point to T, TA, or TU), ED, PP, and bibliographic descriptor (from CAN or ORD. See b-9 above)
   10. Cancellation Message (use area #5)
       line 12: "***PLEASE NOTE***"
       line 13: blank
       line 14-?: "PLEASE CANCEL THE ORDER INDICATED ABOVE"

Data Base Building Specifications

For Extracting Cancellation Output

When attribute CAN (cancellation information) is input, check "Type of Cancellation" in the attribute.
    If Type= D then no cancellation transaction is needed.
    If Type= R or L then create the cancellation transaction.

The cancellation transaction should have some indicator signifying that this is a cancellation record. The presence of the CAN attribute is no indication since CAN is merely a history of cancellations for this record. A possible indicator would be to set PRO= "canc" in the cancellation transaction only.

If the input transaction also contains attribute PRO and PRO= "PO" then a further step is necessary:
    Create a purchase order transaction from the updated record using the P.O. generating specifications after all updates to the entry have been made. The fact that PRO= "PO" should indicate to the printing program that this is a P.O. transaction even though the CAN attribute is present.
This step is necessary to do such things as cancel an order from one vendor and re-issue the order to another vendor.

Purchase Order Program Specifications for Printing Claim Notices

A. General Rules
   1. The Claim Notices should be grouped together following the Cancellation Notices, in sequence by vendor number.
   2. The Claim Notices should be printed using the same specifications as for P. O. printing except as noted below in C.

B. Attributes
   1. All attributes which are to be printed on the P. O. should be printed on the Claim Notices.
   2. The bibliographic descriptor information will be taken from CLD or ORD. If the descriptor in CLD = S then use the descriptor in ORD; else use the descriptor in CLD.

C. Detail specifications and exceptions to general rule A-1 above, (Refer to P. O. specs and form layout.)
   1. Print cover sheet with vendor address as per P. O. specs.
   2. Name of form (area number 1 in form layout.)
      Check Claim Date attribute (CLD).
      a) If object of claim in CLD equals "M" then print "CLAIM NOTICE" on line 1. (centered)
      b) If object of claim in CLD equals "I" then print "CLAIM FOR INVOICE" on line 1. (centered)
      c) In both a) and b) above, print "Dealer Report" on line 3.
   3. Date of order (area number 2) same as P. O. specs.
   4. Order Number (area number 3) same as P. O. specs.
   5. Ship to and billing information (area number 5) same as P. O. specs.
   6. Total estimated price (area number 6) same as P. O. specs.
   7. Vendor Number (area number 7) same as P. O. specs.
   8. Number of Copies (area number 8) -- This information will be in the bibliographic descriptor in either the CLD or ORD attributes (See B-2 above.)
   9. Bibliographic Information, messages, etc. (area number 4) same as P. O. specs except bibliographic descriptor will be taken from either CLD or ORD (see B-2 above.)

Data Base Building Specifications for Extracting Claim Output

The method of creating Claim Notice transactions described below will only be used until a complete update program and a claim date index have been implemented.

When the attribute CLD is input then a claim transaction will be created. The transaction should have some indicator signifying that it is a claim. One method would be to set PRO = "CLAIM" in the claim transaction only.

Before the claim transaction is created the data base entry should be updated. The input CLD attribute should replace any existing CLD attribute in the data base, and be added to the CLA attribute.

COMPUTER NOTES INDEX

No.		Author	Comments	Date
1.	Information Retrieval in High Energy Physics	Parker	Original SPIRES Prop.	12/1/66
2.	Input Forman and Character Set Specifications for SLAC Preprint Collection Computer Reference Retrieval File	Parker	Superseded by # 30	9/66
3.	Draft Specifications for High Energy Physics Reference Retrieval System		See also # 26	1/31/67
4.	Search System	JEG	Superseded by #25 &27	1/26/67
5.	SCAN--A Free Field Read Program	JEG	Superseded by # 25	2/1/67
6.	File Structure Description		Superseded by # 20	
7.	Attribute List		Superseded by # 37	
8.	Physics Retrieval System	Marsheck	Superseded by # 20	5/8/67
9.	Physics Retrieval System	Marsheck	Superseded by # 20	5/2/67
0.	Attribute List			7/11/67
1.	Interim Character Set	Parker		7/19/67
2.	Card Input Format (SLAC Preprints)	Parker	Superseded by # 30	7/27/67
13.	Sample Block in Data Base	Parker	Superseded by # 20	8/1/67
4.	Sample Block in Author Index	Parker	Superseded by # 20	8/4/67
15.	Card Input Format (SLAC Preprints)	Parker	Superseded by # 30	8/4/67
6.	Revision of Data Base Format	Parker	Superseded by # 20	8/10/67
7.	Revision of Index	Parker	Superseded by # 20	8/11/67
18.	Revisions to SLAC Preprints Input Format	Parker	Superseded by # 30	8/11/67
9.	Preliminary File Constructing Program	JG	Obsolete	8/14/67
0.	Final Version of Data Base and Index Formats	JG & Parker		8/15/67
1.	Interim Data Base Output Format	Parker		8/21/67
22.	Suggested Algorithm for Name-Matching	Parker	Superseded by # 31	9/6/67
3.	Revisions to Card Input Format, SLAC Preprints	Parker	Superseded by # 30	9/21/67

No.		Author	Comments	Date
24.	Proposed Algorithm for Date Conversion	Parker	Superseded by # 29	9/27/68
25.	SARSPIS: Syntax Analyzer, Recognizer, Parser and Semantic Interpretation System	JEG	See also # 33 &34	9/29/67
26.	Draft Specifications for an Inform. Retrieval System	Parker		10/2/67
27.	The SPIRES Scope Demonstration System	JG		10/3/67
8.	Specifications for Statistics Records in Index Files	Parker	Obsolete	10/3/67
9.	Revised Date Conversion Algorithm	JEG		11/27/67
30.	Input Format for SLAC Preprints	LA		11/28/67
31.	Name Matching Algorithm	Parker & JG		12/6/67
2.	Attribute List and Descriptions		Superseded by # 37	3/29/68
33.	Modifications to SARSPIS	JEG		4/23/68
4.	Changes in SARSPIS Free Field Scanning Procedure LOOK	JEG		5/15/68
5.	Storing Statistics Concurrent with Updating and Making Use of Them	Caton		6/20/68
6.			Superseded	
7.	Revised Attribute Descriptor Table	HM	Superseded by #47	6/25/68
38.	Preliminary Specifications for the BALLOTS/SPIRES Update Program	Burwell		6/25/68
39.	Language Specifications (Update Program)	Parker & Burwell		7/3/68
0.	Specification of a Supervisor for the Interactive Operation of SPIRES	Riddle		7/9/68
1.	Data Management and Overnight Requests	Marsheck		7/11/68
42.	Translation of DESY Tapes	Clark		7/18/68
3.	File Directory	Marsheck		8/68
44.	Optimization and Recovery for Data Base and Index Building Programs	Clark		8/15/68
45.	On-Line Job Initialization Program Requirements (JIP)	Burwell		8/15/68
46.	Data Base Block Extensions	Marsheck		undated

No.		Author	Comments	Date
47.	Attribute List and Descriptions Alphabetized by Abbreviation	Addis		4/21/69

COMPUTER NOTE #38

PRELIMINARY SPECIFICATIONS

FOR THE

BALANCES/SETTINGS UPDATE

PROGRAM

BY

D.C. BOSWELL

TABLE OF CONTENTS

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I. OVERVIEW

The Update program will be organized into the following sections.

1. executive
2. communication area -- static storage
3. system utilities
4. application programs
    i. DB file control
    ii. user environment loading and maintenance
    iii. DB initialization
    iv. transaction processing
    v. index and DB block searching
    vi. logical record and DB block processing
    vii. index processing
    viii. update termination

A. EXECUTIVE SECTION

The executive directs control between each of the application programs and allocates and releases dynamic storage. Under the single-user batch system, all application programs are assumed to be resident. Under the on-line system, the executive will parcel system resources to each user and load each application program and its environment.

B. COMMUNICATION SECTION

All interface variables and any static storage will be grouped together into a common section. All section and application program interfaces will be handled by the communication section.

Long parameter lists are inefficient and needless. If necessary, parameter blocks will be built and a single parameter will be used to reference the block.

C. SYSTEM UTILITIES

These are subroutines which are used often by many application programs. Again, these subroutines are identified mostly for the forthcoming on-line system. That is, these subroutines are required sufficiently often to make them permanently resident.

D. APPLICATION PROGRAMS

These are DB task-specific and are structured. That is, the lower the level, the narrower the task scope. A description of each application program follows.

II. FILE CONTROL

Opens, closes, and sets the usage of all files depending upon the function to be performed. Under the single-user batch system, this section will be small and simple. However, under the multiple-user on-line system, each user will have a separate section.

III. USER ENVIRONMENT MAINTENANCE AND LOADING

A user environment will include the following.

1. Attribute Name and Other Nouns
2. Attribute Name Abbreviations
3. Attribute Value Kind, e.g. alpha
4. Attribute Element Multiplicity
5. Association Group Definition
6. Element Editing
   - a. maximum bytes per element
   - b. kind checks
     - i. integer
     - ii. address
     - iii. coded
     - iv. alpha
     - v. other
7. Physical Record Specifications
8. Update Commands and Other Verbs
9. "Piece Pairing" Syntax Checks
10. Update Action Array
    - a. Command - Attribute Array
    - b. Chain Algorithm Table
11. Index Editing
    - a. change characters to upper case
    - b. eliminate selective special characters
    - c. word editing
      - i. 3-letter words
      - ii. Inclusion List
      - iii. Exclusion List

d. eliminate surname prefixes
e. eliminate extra blanks

The collection of tables defining a user environment will be grouped into a separate file and be updated by sequence number.

IV. INITIALIZING

Initialization will include

1. index blocks

2. DB blocks

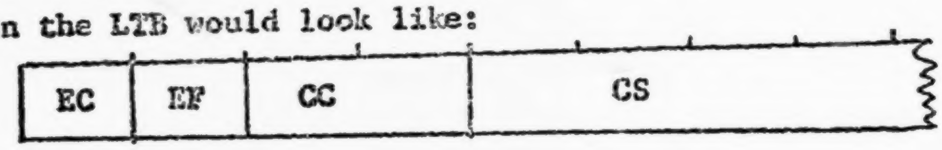
3. loop variables

V. SCANNING AND COMPRESSING INPUT

Scanning is defined as extracting key words, nouns, verbs, prepositions, and elements from an input buffer of update transactions. This input buffer will be called the physical transactions blocks (PTB).

Compressing means eliminating delimiters, quotes and blanks, and extra blanks including leading and trailing blanks within a value.[1] The resultant output of scanning and compressing will be called the logical transaction blocks (LTB).

An entry in the LTB would look like:



where:

EC = entry code { 1 = keyword, 2 = keyword value }

CC = character count

CS = character string

EF = error flag, to be set by editing

---

[1] Eliminate the second and following blanks within a value.

VI. SYNTAX AND ELEMENT CHECKING

A. Syntax Checking

Syntax checking will use a "Piece Pairing" Table (cf. Jim Marcheck's parsing lecture notes dated 6/18/68). A "piece" in this context is update nouns, verbs, prepositions, and elements.

There will be 3 possible results in syntax checking:

i. sequence legal, continue with same logical record
ii. sequence legal, last piece for this logical record
iii. sequence illegal

This means a Piece Pairing Table will consist of sub-tables to correspond to i. and ii. above. Of course only the element-ID sequence (see Update Statements section) would cause action ii. But a special set of user-specific commands might also.

B. Element Checking

Element checking will include:

1. maximum number of bytes per element per attribute

2. attribute kind checks

kind	checks
i. integer	high, low limit checks
ii. address	
iii. coded	discrete values
iv. alpha	
v. other	special checks

There will be 4 levels of error messages and resulting actions.

1. catastrophe, skip to next ID piece, don't update this logical record.

2. error, skip to next attribute, don't update this attribute.

3. error, continue scan, don't use this element.

4. warning, continue scan, use this element.

All errors will be reflected in the LTB error flag.

VII. INDEX AND DB BLOCK SEARCH

In addition to index blocks and DB blocks, I would like to propose adding an index-index (IXIX). An IXIX would contain IX block numbers corresponding to a given hash code. An IX block would be structured essentially as is currently documented. IXIX would be assigned block 0 of the index file and look like this:

IXIX#1	IX#1,1
⋮	
IXIX#2	IX#2,1
⋮	

Suppose a logical record is to be added to an existing file. The following actions would take place.

1. Logical record ID # would be hashed yielding an IXIX#
2. IXIX numbers would be ordered monotonically increasing. IXIX entry position would be calculated (regula falsi).
3. Each index block in the IXIX entry would be searched looking for a match on "KEY", noting the block with the greatest unused space beyond a given threshold.
4. In this example there would be no match on "key". Hence a DB entry would be added as well as an initial index entry to the index block with the greatest unused space. If no available index block existed, a new index block would be started and its number added to the IXIX entry.
5. If adding a secondary entry to an index block causes overflow, an initial entry and its secondary entries will be moved to another or new index block.

As a consequence, 2 desirable results would occur:

1. no overflow index blocks
2. secondary entries will be in the same block as the initial entry.

VIII. LOGICAL RECORD AND DB BLOCK BUILDING AND MAINTENANCE

The structure of a DB block will remain essentially as is currently documented.

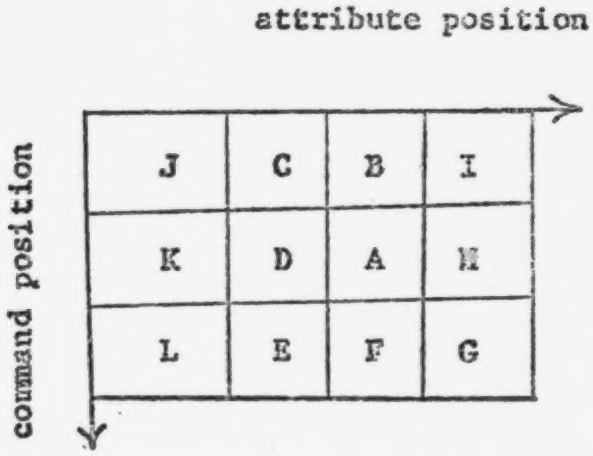
Transactions against a given logical record will be processed as a unit, i.e. edited, syntax checked, etc.

Entry transactions will be matched against logical record entries (elements) and an updated DB block will result as is done in the Phase I [illegible].

An Update Action Array will be part of the user's environment. This will consist of a 2 dimensional array of attribute positions vs. update command position -- position within the environmental tables. Each entry would contain an algorithm chain number. An action chain would have a series of action numbers.

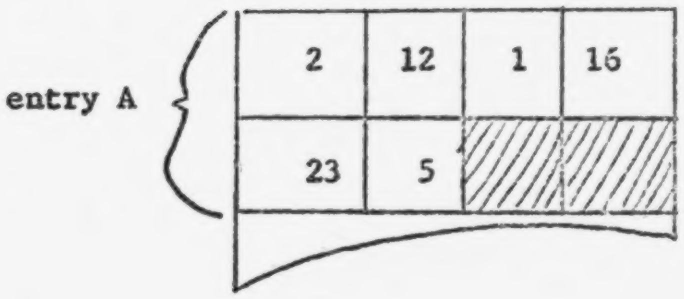
Pictorially, the relationship is following

COMMAND-ATTRIBUTE ARRAY



J	C	B	I
K	D	A	H
L	E	F	G

CHAIN ALGORITHM TABLE



2	12	1	16
23	5	▨	▨

Statistical algorithms and citation processing would merely be a subset.

IX. INDEX EDITING, BUILDING, AND MAINTENANCE

There will be an Index Editing Table (IET) for each user consisting of attribute vs. editing algorithms. The following current editing algorithms will be retained.

1. CAPS
2. CMPRESS
3. SPECOUT
4. GARBOUT
5. DUPLIST

6. NAMSYL

Inclusion and exclusion lists will be user-specific.

X. FINAL WRAP-UP

This is essentially the same as the ENDRUN procedure of PPINPUT. That is, it will:

1. write the last DB and index blocks.
2. call the File Control section to close the remaining open files.

XI. UPDATE SYNTAX CONVENTIONS

1. Braces, { }, mean a choice is required.
2. Brackets, [ ], mean the clause is optional.
3. Underlining means the clause is repeatable.
4. Words printed are literal and keywords.
5. Words written are figurative.

XII. FIGURATIVE UPDATE WORDS

1. Entry-id: logical record identification
2. Update-action: create, add, delete, replace, change
3. Attribute-description: includes attribute and attribute-value
4. Attribute-value: the collective set of attribute elements
5. Attribute element: a single value within an attribute, e.g. AUTHOR = "BROWN, S.E.". Author is an attribute, Brown, S.E. an element.

XIII. UPDATE STATEMENTS DESCRIPTION

A. FOR Clause

The FOR clause defines an association group, i.e. assigns a set number. In addition, it allows indirect specifications of an element. For example, delete a title whose author is S.E. Brown. The title with the same set number as the author would be deleted.

B. DELETE Command

1. DELETE ALL: delete a logical record
2. DELETE ALL attributes: delete an entire attribute
3. DELETE attribute (att-count): delete the att-count occurrence of the attribute

C. REPLACE Command

Replace an entire attribute element defined by attribute-description-1 to the value specified by attribute-value.

D. ALTER Command

Alter the portions of the attribute element defined by attribute-description-1 to the value specified by attribute-value.

XIV. UPDATE STATEMENTS

General form for creating, adding, or deleting DB entries or elements:

ID 'entry-id' update-action attribute-description-1

[FOR attribute-description-2]

A. Create a DB entry or add DB elements to an existing entry

$\left\{\begin{matrix}\text{CREATE}\\ \text{ADD}\end{matrix}\right\}$ attribute 'att-val-1' [FOR attribute 'att-val-2']

B. Delete a DB entry or DB elements

1. DELETE ALL
2. DELETE [ALL] attribute [att-val-1] [FOR attribute 'att-val-2']
3. DELETE attribute ['att-val'] [(att-count)]

Attribute count means occurrence -- an attribute entry or the occurrence of an attribute with a given value.

General form for replacing or changing DB entries or elements:

$$\left\{\begin{matrix}\text{ALTER}\\ \text{REPLACE}\end{matrix}\right\}\ \underline{\text{attribute-description-1}\ \left[\left\{\begin{matrix}\text{TO}\\ \text{WITH}\end{matrix}\right\}\ \text{attribute-value}\right]}$$

$$\underline{[\text{FOR attribute-description-2}]}$$

C. Replace entire DB entries or replace or change DB elements

1. REPLACE ALL WITH attribute 'att-val'

2. $\left\{\begin{matrix}\text{ALTER}\\ \text{REPLACE}\end{matrix}\right\}$ [ALL] attribute ['att-val-1'] $\left\{\begin{matrix}\text{TO}\\ \text{WITH}\end{matrix}\right\}$ 'att-val-2'

   [FOR attribute 'att-val-3]

3. $\left\{\begin{matrix}\text{ALTER}\\ \text{REPLACE}\end{matrix}\right\}$ attribute ['att-val-1'] [(att-count)]

   $\left\{\begin{matrix}\text{TO}\\ \text{WITH}\end{matrix}\right\}$ 'att-val-2'

XV. MISCELLANEOUS FEATURES

A. Delete/replace attribute value qualification

The attribute value to be deleted or replaced could be partially but uniquely specified. For example, consider the following attribute entries.

1. Leave this one alone.
2. Remove this one.
3. Not this one.

A transaction

DELETE attribute 'REMOVE'

makes number 2 unique.

XVI. THINGS UNDONE

1. Storage Requirements
    - a. Static
    - b. Dynamic
    - c. Program
2. Definition Communication Section
3. Manpower Requirements
    - a. Detail Specifications
    - b. Coding
    - c. Checkout and Integration
    - d. Documentation

STANFORD UNIVERSITY LIBRARIES

PROJECT BALLOTS

Study of Present Acquisition System

By

Diana D. DeLanoy

TABLE OF CONTENTS
ACQUISITION CURRENT SYSTEM

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  - 2. output 3301 - 3399
- D. Files 4301 - 4399

VI. Resources Development
  A. Discussion
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VII. Miscellaneous

NOTE - Although Binding and Finishing is a part of the Acquisition Division, functionally it belongs more with Serials and will be covered at a later date.

Input Doc. X

Output Doc.

ORDER DEPARTMENT
ORGANIZATION

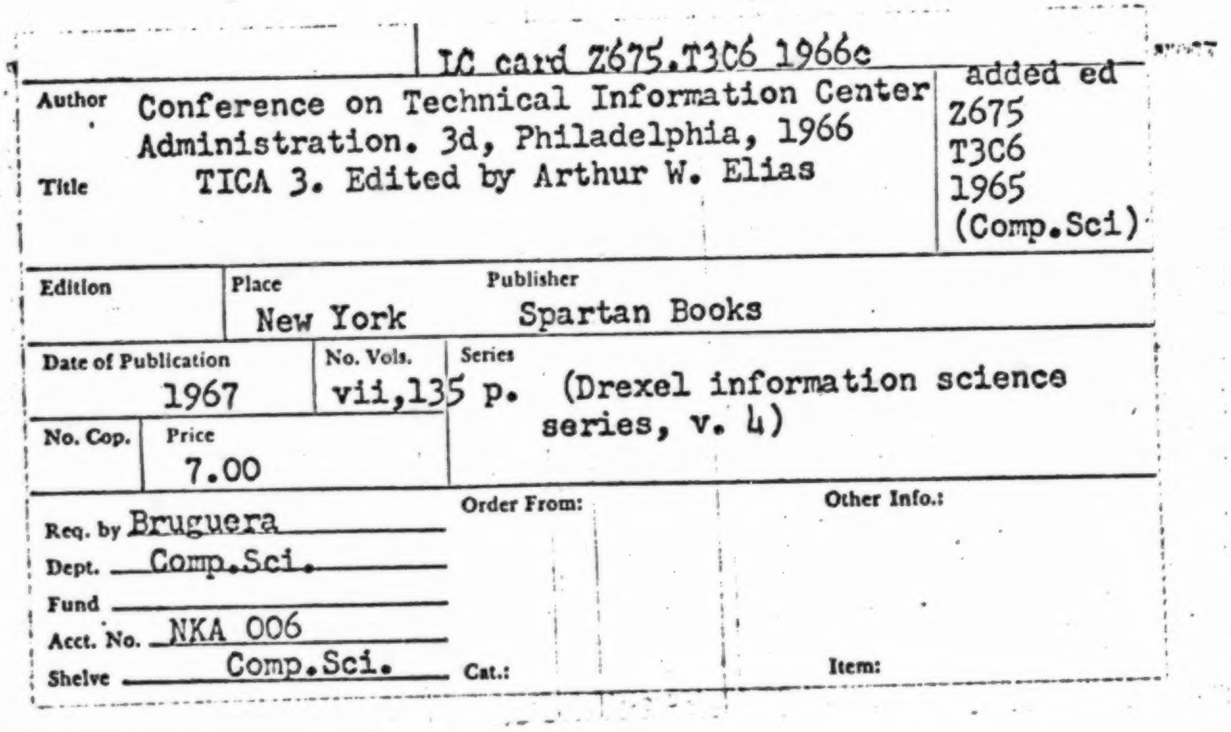
DOCUMENT INVENTORY

No.	Document Name	Source	Destination	Peak Volume	Average Volume	Frequency	Peak Period
2001	SUL-5, 7A Order File Slip	yellow	Order File				
2002	SUL-7 Dealer File Slip	orange	Dealer File				
2003	SUL-7, 7A Cataloging Slip	green	Order File				
2004	SUL-7, 7A Requestor Notice	pink	Order File				
2005	SUL-7, 7A Fund File Slip	blue	Order File or Fund File				
2006	SUL-25, 25A Book Requisition	white Requestor	Order File				
2007	SUL-7 Dealer Report	white Dealer	arrives with material, is not kept				
2008	Invoice	Dealer	Paid Invoice File				
2009	SUL-80 Serial Slip		Order File and/or Serial Payment File				
2010	SUL-5 Search & Quote	Resources Development	Search & Quote File				
2011	Dealer supported Process Slips	Abel or Stacey	Appropriate File				

Order Department
ORGANIZATION

2006
FORM NUMBER

SUL-25, 25A
FORM NAME
Book Requisition Order Card



LC card Z675.T3C6 1966c

Author Conference on Technical Information Center Administration. 3d, Philadelphia, 1966
Title TICA 3. Edited by Arthur W. Elias

added ed
Z675
T3C6
1965
(Comp.Sci)

Edition
Place New York
Publisher Spartan Books

Date of Publication 1967
No. Vols. vii,135 p.
Series (Drexel information science series, v. 4)

No. Cop.
Price 7.00

Req. by Bruguera
Dept. Comp.Sci.
Fund
Acct. No. NKA 006
Shelve Comp.Sci.

Order From:
Cat.:

Other Info.:
Item:

EXPLANATION:

The SUL-25A is used for requesting books (the originator keeps a carbon).

The SUL-25 form is used for requesting books and is also used as the basis for annotating the results of searching and establishing.

ORDER DEPARTMENT
ORGANIZATION

FILE INVENTORY

No.	File Name	File Content	Seq.	Peak Volume	Average Volume	Access Frequency	Peak Period
4001	LC Title II	Library of Congress Catalog Cards	Main Entry	6/30 12/31		hourly	M-F
4002	Order	Process slips for on order and received files	Main Entry		10,000 in process	hourly	Morning M-F
4003	Dealer	Dealer slips for on-order and received files	P.O. No.		See detail	hourly	4-5 M-F
4004	Fund	Fund slips for expensive acquisition and orders committed to restricted funds	Fund		2,000 since 9/66	daily	Aug. 31
4005	Cancellation	Process slips for cancelled orders	Main Entry		2,100 per year		
4006	University Press	Dealer supplied process slips for Univ. Press Material			1,200 since 9/66	weekly	M-F
4007	Approval	Process slips for items received and retained on approval	Dealer		1,800 since 9/66	daily	M-F
4008	Outstanding Overseas Order	Requests and outstanding overseas orders	Main Entry		50	random	M-F
4009	Receipt without Invoice	Fund slips for material received without invoice	Dealer		200	daily	M-F
4010	Invoice without Receipt	Invoices received prior to material receipt	Dealer		150	daily	M-F
4011	Requestor Notice	Pink process slip to be sent to requestor on receipt of book	Requestor			daily	F

Order Department
ORGANIZATION

4002
FILE NUMBER

FILE NAME Order File

CONTENT Purchase order process slips
Sequence Alpha by main entry

Description and Use:

The Order file serves as a central storage and reference location for all purchase orders in process, and for material received, not yet cataloged.

When a procurement order is placed, the purchase information, contained on process slips, is filed in the Order file. The slips are periodically maintained throughout the activity cycle of an order. When the status of an order changes the change is reflected in the file. Cancelled orders are purged from the file.

There are several order categories; thus, in order to ease the accessing process, each order is flagged according to type or status.

Items flagged in red indicate:
1) Monograph orders not yet received, or
2) Multi-volume sets, other than continuation material, which have been partially received.

A blue flag indexes a standing order of a complete work or series. Also, a blue flag replaces a red for a partially filled order when the committed dollars are spent.

Yellow and green flags identify "On Approval" orders for which purchase orders are not prepared. These file entries usually consist of an LC Card and a request slip.

When the order material is received in full the various flags are removed, but a slip, stamped with the date of receipt, remains in the file.

When orders are cancelled the process slips are transferred to the Cancellation File.

Orders for the Meyer Undergraduate Library are maintained in a separate file but the same filing system is employed.

Order Department
ORGANIZATION

4002
FILE NUMBER

1. FILE NAME - Describe as needed: Order File

2. SEQUENCE - Main entry - usually author

3. RECORDS - No. in File: 4,700 in process
average ______ maximum ______ minimum

Retention Period: until order cataloged
in this file ______ after removal from file

4. INPUTS - Average No. Per see statistical survey results
day, week, month, etc. ______ additions ______ changes ______ deletions

Source Document for Inputs:

5. ACCESS TO FILE - x random and x cyclic ______ other - describe

Frequency of reference: see survey results
number per hr., day, week, etc.

6. MAINTENANCE - Describe: Additions are made primarily when purchase
Additions orders are generated and non P.O. types of material are received.

Changes - Changes are made to reflect changes in the status of an order (receipt).

Deletions-Purging sometimes occurs after cataloging.

6.7 Project Management Standards

(referred to in subsection 2.2.2)

1. System Development Process
2. Project Standards (DS.001)
3. Task Control Sheet (DS.002) (The standard given here is for a more recent version of Figure 2 on page 20.)
4. Schedule Forms SB-3, SB-4, and SB-5 (DS.009)

SYSTEM DEVELOPMENT PHASE ACTIVITIES

Ⓐ -WHAT- Ⓑ Ⓒ -HOW- Ⓓ Ⓔ -DO IT- Ⓕ

	PRELIMINARY ANALYSIS	DETAILED ANALYSIS	GENERAL DESIGN	DETAILED DESIGN	IMPLEMENTATION	INSTALLATION
SYSTEM ANALYSIS AND USERS	1) Define policy 2) Define goals 3) Define user environment 4) Document current system 5) Analyze current system 6) Define long term scope 7) Define alternative subscopes for first implementation 8) Analyze subscopes 9) Select subscope for first implementation	1) ENUMERATE REQUIREMENTS -Performance -General I/O -Transformation Rules -Volumes -Cost estimates and limits -Detailed design of I/O documents	0) EXTERNAL DESIGN Organization Procedures	0) EXTERNAL DESIGN -Training -File buildup -Related activities	0) EXTERNAL IMPLEMENTATION -Liason -Training of primary personnel -Equipment installation 0) Complete user and marketing documentation	0) TRAINING (secondary personnel)
PROGRAMMING, SYSTEM ANALYSIS AND USERS	10)Work out modifications	4) Work out changes where needed	4) Select best software solution	3) Create implementation plan 4) Create testing plan -- system test, pilot test	4) Critique system testing 5) Pilot testing 6) Critique pilot testing 8) Prepare support plan	2) CUTOVER -- parallel operation 3) WISHBOOK 5) Prepare final narrative
PROGRAMMING	11) Establish gross technical feasibility	2) Analyze technical feasibility of requirements 3) Analyze gross hardware needs	1) Conceptualize alternative software solutions 2) Conceptualize alternative hardware needs 3) Analyze alternatives 5) Choose hardware configuration	1) DETAILED INTERNAL DESIGN BY MODULE 2) Creation of programming specifications	1) CODE 2) UNIT TESTING 3) SYSTEMS TESTING 7) Modification as required	1) CONVERT FILES 4) Gather performance statistics
OUTPUT DOCUMENTS	SCOPE DOCUMENT	REQUIREMENTS DOCUMENT	GENERAL DESIGN DOCUMENT	PROGRAMMING SPECIFICATIONS IMPLEMENTATION PLAN.TEST PLAN	TESTED PROGRAMS USER DOCUMENTATION. MAINTENANCE DOCUMENTATION. TEST RESULTS	FILES; PERFORMANCE STATISTICS, SUPPORT PLAN, PROJECT HISTORY, WISHBOOK

SPIRES/BALLOTS PROJECT

DOCUMENTATION STANDARD DS.001

Section

Page 1 of 2

Date 5/6/70)R(

TITLE: PROJECT STANDARDS

PURPOSE. Standards are formulated to advise project staff of methods, forms, procedures and schedules which must be adherred to in completing tasks. There are three general types of standards, ADMINISTRATIVE STANDARDS, DOCUMENTATION STANDARDS, AND TECHNICAL STANDARDS. (1) Administrative Standards originate with project management. They encompass matters which are determined by the project management, such as, long-range plans, schedules, and task lists. In addition, other material relating to overall development policy may be issued as an Administrative Standard. (2) Documentation Standards are primarily formulated by the Documentation Office and approved by project management. They include standards for writing, recording, revising and disseminating records of project activity. Examples of Documentation Standards are forms and instructions for completing forms. (3) Technical Standards are primarily formulated by the technical section of the project staff and are approved by management. They include standards relating to coding, testing and debugging programs as well as instructions for the use and maintenance of program modules.

STANDARDS DOCUMENTATION. Standards are initially issued in draft form for review. When a Standard has been approved a data set is created by the documentation staff using the following naming convention:

DUG.DOC.XS.NNN

Where x is either A, D or T standing for Administrative Documentation or Technical Standard. NNN refers to the sequence number for the standard which will be in the range 001 - 999. A hard copy of the Standard is prepared on the formatted form SB-2.

DISTRIBUTION. After an original hard copy of the Standard has been made two copies are xeroxed and each is routed to half of the staff for immediate notification. Enough copies are then xeroxed for each staff member's Project Control Notebook. These are put in the appropriate section of each notebook by the secretarial staff. About ten extra copies are then xeroxed and returned to the Documentation Office. These are put in a folder in the Standards file. Additional copies of the standard may be secured on request by any project staff member.

REVISION. Proposed revisions to a Standard are forwarded to the Documentation Office. If approved, a revised standard is issued with the revision box checked on the S/B-2. Distribution follows the above procedure.

SPIRES/BALLOTS PROJECT DOCUMENTATION STANDARD DS.001	Section
	Page 2 of 2
	Date 5/7/70N( )R( )

TITLE: PROJECT STANDARDS

INDEX. Two indexes, to standards are produced and maintained by the Documentation Office. A Standard Number index and an Alphabetical Title index. These indexes are placed in the front of the Standards section of the Project Control Notebook. They are revised periodically.

SPIRES/BALLOTS PROJECT	Section
	Page 1 of 4
DOCUMENTATION STANDARD DS.002	New ( ) Rev (X)
	Date 11/6/70

TITLE: TASK CONTROL SHEET FORM I/F-1(11/70) Supercedes S/B-1(4/70)

INTRODUCTION: This standard describes the use of the Task Control Sheet (TCS). A Task Control Sheet documents and communicates a task assignment, description and schedule. It permits managers and project staff to coordinate tasks and allocate time for task effort. The information on a completed Task Control Sheet is used to evaluate task performance and analyze problems for future improvement.

When a task is assigned some sections of a TCS are filled out by the person who assigns the task, and other sections are filled out by the secretarial staff who also handle copying and distribution. When a task is completed sections not filled out at task assignment are filled out and the secretarial staff handles copying, distribution, and storage of additional copies of task documentation for future demand. The following paragraphs describe the use of the TCS when the task is assigned (1.0) and when the task is completed (2.0).

1.0 TASK ASSIGNMENT

1.1 Analysis/Design Staff Responsibilities

The following sections of the TCS are filled out by the person who assigns the task (assigner) or by him and the person to whom the task is assigned (assignee).

2. TASK TITLE: Provide a short, three or four word, title which can be easily transferred to a schedule form (S/B-3, S/B-5).

3. ASSIGNMENT: Provide names or initials of all persons assigned and the names of all users who will contribute to or approve the task result. After the TCS is typed the assignee(s) initials and dates 3A, the assigner initials and dates 3B, and the user initials and dates 3C. Users initials may be inserted by the assigner with the user's verbal approval.

4A. TASK PERFORMANCE (Scheduled): Supply the starting date, completion date and approximate hours the task requires. The assigner is responsible for the information is this section.

5. TASK DESCRIPTION: Give a full description of the task.

6A. DOCUMENTATION REQUIRED: Describe what is to be included in the documentation, such as a sample output, or Job Control Language statements. Indicate the audience or use to be made of the documentation where this might be helpful. Estimate number of pages required if this is possible.

7. INTERFACES/CONTSTRAINTS: Indicate previous task documentation that might help in performing this task, staff members with special

knowledge, or printed sources of information. Constraints imposed by project managment or users should be stated. Indicate sources to which policy questions should be directed.

1A. DISTRIBUTION (Task Assignment): List T1 includes the analysis/design staff and the Principal Investigators. Add initials of "Other" such as users, library or Computation Center personnel who should be notified of a task.

10. TASK AND PHASE: Insert Task area indicator and Phase letter. Task areas are B=BALLOTS, C=Common, D=Documentation, and S=SPIRES. Phases are A=Preliminary analysis, B=Detailed analysis, C=General design, D=Detailed design, E=Implementation, and F=Installation. The task number is inserted by a member of the secretarial staff after the task area indicator and is taken from a task number log.

1.2 Task Control Sheet Typing
After he prepares a handwritten copy of the TCS, the assigner sends it to be typed and returned for proofing. The The proofed copy is initialed by the assigner, assignee(s) and user(s) in section 3 and sent to the secretarial staff to be prepared for distribution.

1.3 Secretarial Staff Responsibilities
When a typed TCS with initials in section 3 is received the following sections are completed on the typed original.

9. COMLETION DATE: copy this directly from the "Completion Date" in section 4A.

10. TASK NO.: Take the next task number from the task number log and insert it here. Most task numbers have three characters and zeros may be inserted for numbers below 100, e.g. 008, 053 etc. Subtasks are identified by decimal point task numbers, e.g. S.008.01. Subtask numbering is usually put on the form by the assigner.

11. PAGE: Insert page number.

The number of copies and distribution is determined by looking at 1A DISTRIBUTION. The original is always sent to Documentation.

2.0 TASK COMPLETION

2.1 Analysis/Design Staff Responsibilities
When a task is completed to the satisfaction of the assigner, his copy of the TCS is stamped and initialed in the area below section 9 at the top of the page. The following sections are completed before

forwarding the task and documentation for distribution.

4B. TASK PERFORMANCE (Actual): Insert the actual Start Date, Completion Date and Approximate Hours. If the Actual and Scheduled lines differ significantly explain this in section 8.

6B. DOCUMENTATION (Data set information): If documentation is in data set form supply dsname, account and file(s).

8. HINDSIGHT COMMENTS: Describe problems involved in completing the task and anything that might be useful in improving the performance of future tasks.

1B,1C. DISTRIBUTION (Task Completion): Insert after "Other" in 1B the initials of anyone you want to notify that the task is completed. Frequently this will be the same as the "Other" group in 1A. After "Other" in 1C insert initials of anyone you want to receive a copy of the full task documentation.

After completing these sections on the assigners copy of the TCS, it is sent to the secretarial staff with an original of the final documentation.

2.2 Secretarial Staff Responsibilities

When a stamped copy of a TCS with attached documentation is received, xerox and distribute as indicated in 1B and 1C. The copy with the red stamp on it is always sent to Documentation with the original documentation. Five extra copies of the TCS and documentation are made and kept in a "TASKS COMPLETED" file. All requests for additional copies of a task must be approved by the Documentation Office.

3.0 TASK DOCUMENTATION REQUEST

If you receive a TCS and you needthe full documentation, initial section 12 "Documentation needed" and send it to the Documentation Office. The TCS will be returned with a copy of the documentation. The Documentation Office will keep a record of all requests for documentation.

4.0 CANCELLED TASKS

4.1 Analysis/Design Staff Responsibilities

Tasks may be cancelled only by the assigner. The reasons for cancellation are written in section 8. HINDSIGHT COMMENTS and 1B. and 1C. DISTRIBUTION are filled in. The TCS is sent to the secretarial staff.

TITLE: TASK CONTROL SHEET FORM I/F-1(11/70) Supercedes S/B-1(4/70)

4.2 Secretarial Staff Responsibilities Xerox and distribute as indicated in 1B and 1C DISTRIBUTION.

5.0 REVISED TASKS

5.1 Analysis/Design Staff Responsibilities
Tasks may be revised only by the assigner. An annotated TCS is prepared with all necessary changes. In the upper right hand corner write "REVISED TASK" preferably in red pencil. The TCS is sent to the secretarial staff for typing.

5.2 Secretarial Staff Responsibilities
Retype and have proofed by the assigner as described in 1.2 above. Reissue as described in 1.3 above. Type REVISED TASK above the task number.

TASK CONTROL SHEET (TCS)

1 DISTRIBUTION
A) Task Assignment: (TCS only)
List: T1 Other__________
B) Task Completion: (TCS only)
List: T2 Other__________
C) Task Completion: (TCS & doc.)
List: T3 Other__________

9 Task Completion Date
____

10 Task No. | Phase

11 Page____ of____

12 Documentation Needed______

2 TASK TITLE:

3 A) PERSON(S) ASSIGNED:________________ INITIALS:________ DATE:________
B) ASSIGNED BY:________________ INITIALS:________ DATE:________
C) USER: ________________ INITIALS:________ DATE:________

4

TASK PERFORMANCE:	START DATE	COMPLETION DATE	APPROX HRS.
A) SCHEDULED:	________	________	______
B) ACTUAL:	________	________	______

5 TASK DESCRIPTION:

6 A) DOCUMENTATION REQUIRED:

B) DSNAME: ACCOUNT: FILE:

7 INTERFACES/CONSTRAINTS:

8 HINDSIGHT COMMENTS:

TASK CONTROL SHEET (TCS)

1 DISTRIBUTION
A) Task Assignment: (TCS only)
List: T1 Other D. Weber
B) Task Completion: (TCS only)
List: T2 Other
C) Task Completion: (TCS & doc.)
List: T3 Other

9 Task Completion Date
8/10/70

10 Task No. C.012 | Phase B

11 Page 1 of 1

12 Documentation Needed

2 TASK TITLE: General Recovery Specifications

3
A) PERSON(S) ASSIGNED: W. Kiefer INITIALS: WK DATE: 7/8/70
B) ASSIGNED BY: J. Schroeder INITIALS: JS DATE: 7/8/70
C) USER: E.B. Parker, D.C. Weber INITIALS: EP DW DATE: 7/9/70

4 TASK PERFORMANCE:

	START DATE	COMPLETION DATE	APPROX HRS.
A) SCHEDULED:	7/12/70	8/10/70	72
B) ACTUAL:			

5 TASK DESCRIPTION:

1. Survey the literature, and derive a list of possible failure conditions.
2. Study implementation concepts used on the Campus Facility System, and any others you consider applicable.
3. For SYSTEM RECOVERY (to include 'soft crash', Data Base integrity, partial system recovery with operator intervention, and system recovery w/o operator intervention; in the order specified) investigate feasibilities for each error condition ennumerated in Step 1.
4. Conceptualize testing techniques that will allow simulations of the various error conditions during implementation and check-out.
5. For Data Base recovery, investigate
    a. Reconstruction of Data Base and indexes from a prior dump and the transaction log.
    b. Partial reconstruction of indexes for specific records w/o reference to a log tape.
6. List design concepts to facilitate 3 and 5 above.
7. Conduct a staff conference to gather comments.

6 A) DOCUMENTATION REQUIRED: Write a paper to document your findings. Most of it should be understandable to the non-technical reader.

B) DSNAME: ACCOUNT: FILE:

7 INTERFACES/CONSTRAINTS: James Moore, Campus Facility System Group
SLAC Facility
O/S SER Modules (MVT, PLM and microfiche)

8 HINDSIGHT COMMENTS:

TASK CONTROL SHEET (TCS)

1 DISTRIBUTION
A) Task Assignment: (TCS only)
List: T1 Other D. Weber
B) Task Completion: (TCS only)
List: T2 Other D.Weber
C) Task Completion: (TCS & doc.)
List: T3 Other

9 Task Completion Date
8/10/70

COMPLETED DATE 8/14/70
APPROVED DS

10 Task No. C.012 Phase B

11 Page 1 of 1

12 Documentation Needed

2 TASK TITLE: General Recovery Specifications

3 A) PERSON(S) ASSIGNED: W. Kiefer INITIALS: WK DATE: 7/8/70
B) ASSIGNED BY: J. Schroeder INITIALS: JS DATE: 7/8/70
C) USER: E.B. Parker, D.C. Weber INITIALS: EP DW DATE: 7/9/70

4 TASK PERFORMANCE:

	START DATE	COMPLETION DATE	APPROX HRS.
A) SCHEDULED:	7/12/70	8/10/70	72
B) ACTUAL:	7/12/70	8/14/70	65

5 TASK DESCRIPTION:

1. Survey the literature, and derive a list of possible failure conditions.
2. Study implementation concepts used on the Campus Facility System, and any others you consider applicable.
3. For SYSTEM RECOVERY (to include 'soft crash', Data Base integrity, partial system recovery with operator intervention, and system recovery w/o operator intervention; in the order specified) investigate feasibilities for each error condition ennumerated in Step 1.
4. Conceptualize testing techniques that will allow simulations of the various error conditions during implementation and check-out.
5. For Data Base recovery, investigate
    a. Reconstruction of Data Base and indexes from a prior dump and the transaction log.
    b. Partial reconstruction of indexes for specific records w/o reference to a log tape.
6. List design concepts to facilitate 3 and 5 above.
7. Conduct a staff conference to gather comments.

6 A) DOCUMENTATION REQUIRED: Write a paper to document your findings. Most of it should be understandable to the non-technical reader.

B) DSNAME: WK.RECOVERY ACCOUNT: F831 FILE: filef and h

7 INTERFACES/CONSTRAINTS: James Moore, Campus Facility System Group
SLAC Facility
O/S SER Modules (MVT, PLM and microfiche)

8 HINDSIGHT COMMENTS: Clerical overload held up task completion several days.

SPIRES/BALLOTS PROJECT

DOCUMENTATION STANDARD DS.009

Section	
Page 1 of 1	
Date 5/18 N( )R( )	

TITLE: SCHEDULE FORMS SB-3, SB-4, and SB-5

PURPOSE. These general purposed scheduling forms are available to the project staff for planning and scheduling of tasks.

FORMS.	S/B-3	Schedule -- 6 month period
	S/B-4	Schedule -- yearly
	S/B-5	Schedule -- daily

Samples of the three forms are attached. S/B-3 and S/B-4 are mainly for long-range planning, S/B-5 is a working schedule for optional use by all staff members. A filled out sample of S/B-5 is attached.

AVAILABILITY. These forms are available in the Documentation Office on request.

SPIRES/BALLOTS SCHEDULE - MARCH TO AUGUST 19

TITLE:

TASK NO.	TASK NAME:	MARCH				APRIL				MAY					JUNE			
		6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26

BY:
DATE:
REV.DATE:

SPIRES/BALLOTS SCHEDULE - MARCH TO AUGUST 1970

MARCH				APRIL				MAY					JUNE				JULY					AUGUST			
6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28

SPIRES/BALLOTS
PROGRAM SCHEDULE (WEEKLY 1970)

	1970																																		
	JAN					FEB				MAR				APR				MAY					JUN				JUL					AUG			
	2	9	16	23	30	6	13	20	27	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28
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NOTES:

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SPIRES/BALLOTS

OGRAM SCHEDULE (WEEKLY 1970)

1970																																																	
AN			FEB				MAR				APR				MAY					JUN				JUL					AUG				SEP				OCT					NOV				DEC			
	23	30	6	13	20	27	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52

SPIRES/BALLOTS
DAILY WORKING SCHEDULE

DOCUMENTATION TASKS

TASK NO.	TASK NAME	MONTH	APRIL										MAY											
		DAY	20	21	22	23	24	27	28	29	30	1	4	5	6	7	8	11	12	13	14	15	18	19
010	Proofreading Standard			▼																				
008	Forms, Standard, DS 101-115					▽																		
003	BALLOTS Newsletter					▼																		
005	Project Notebook												▽											
011	Revise Task list						▽																	
007	DOC Standard 001						▽	▼																
009	Standards Index							▽																
004	1st Quarterly Report							▽																
006	April OE Report										▽													
012	Doc Standard 100																▽							
013	Scope Doc 2nd Printing																						▽	
014	Flowchart Standards																							▽
015	Research in Computing																							
016	SPIRES Annual Report																							

NOTES: ▼ = Task completed

SPIRES/BALLOTS
DAILY WORKING SCHEDULE

APRIL →							← MAY →																			
23	24	27	28	29	30	1	4	5	6	7	8	11	12	13	14	15	18	19	20	21	22	25	26	27	28	29
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SAMPLE

S/B-5 (4-70)

SPIRES/BALLOTS
DAILY WORKING SCHEDULE

TASK NO.	TASK NAME	MONTH																				
		DAY																				

NOTES: __________

SPIRES/BALLOTS
DAILY WORKING SCHEDULE

S/B-5 (4-70)